ONLINE INTERACTIVE BIOLOGY LEARNING SYSTEM (OIBLS)

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Abstract

Online Interactive Biology Learning System (OIBLS) is a Web-based Learning-teaching system for upper secondary school level specifically to students who are taking the Sijil Tinggi Pelajaran Malaysia (STPM). Upper secondary school students and teachers are the target of this system. It can be a teaching tool or as a self-learning program.

The strength if OIBLS is that it provides lessons to educate users on the meaning of Biology specifying on the topics namely Life Processes, Green Plants, Humans as Organism, Variation, Inheritance and Evolution. There are tutorials that test the student's and worksheets that can be downloaded for further practice. Games based on the topics will be created for students to increase the interest of learning Biology and to test their skills.

This project aims to create an effective and interesting learning tool to enable students learn and enjoy Biology at the same time. OIBLS, is a web-based application could increase the number of computer literate students through an interactive and interesting way of learning Biology.

The waterfall model with prototyping will be development model used to develop OIBLS. The main advantage of this system is that the process can be tailored to meet the specific requirements yet possibly changing needs of any application.

As OIBLS is an interactive multimedia web-based system, tools that will be used for the development comprises of Macromedia Flash 5, Macromedia Dreamweaver 4, and Adobe Photoshop, ASP, HTML and JavaScript are the programming languages that will be used and Microsoft Access 2000 serves as the database to store information of the system.

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Next, I would like to thank my course mates who gladly shared their knowledge and experiences. The discussions held allowed us to realize the weaknesses and strength of each other's system. With that, we are able to improve the weakness and improve the quality of our system.

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Table Of Contents

Chapter 6: System Testing

Chapter 7: System Evaluation

List Of Figures

Chapter 5

Chapter 1 - Introduction

1.1 The Future of Multimedia in Education

Many predictions have been made about the future of education, the demise of the classroom-based teacher, and an information technology lead revolution in schools, universities and organizations. There is little doubt that a significant percentage of educational activity will take place online. By mid-1996 there were over 2000 courses already offered on the World Wide Web *(Tapscott, 1996)*. That number has been growing steadily as strategic plans of universities and educational governance bodies worldwide have been pushing for alternative solutions to dwindling education budgets.

1.2 Project Definition

Biology literally means "the study of life". Biology is such a broad field, covering the minute workings of chemical machines inside our cells, to broad scale concepts of ecosystems and global climate change. Biologists study intimate details of the human brain, the composition of our genes, and even the functioning of our reproductive system. Biologists recently all but completed the deciphering of the human genome, the sequence of deoxyribonucleic acid (DNA) bases that may determine much of our innate capabilities and predispositions to certain forms of behavior and illnesses. DNA sequences have played major roles in criminal cases (O.J. Simpson, as well as the reversal of death penalties for many wrongfully convicted individuals), as well as the impeachment of President Clinton (the stain at least did not lie). We are bombarded with headlines about possible health risks from favorite foods (Chinese, Mexican, hamburgers, etc.) as well as the potential benefits of eating other foods such as cooked

tomatoes. Information tout the benefits of metabolism-adjusting drugs for weight loss. Many Americans are turning to herbal remedies to ease arthritis pain, improve memory, as well as improve our moods.

Can a biology book give you the answers to these questions? No, but it will enable you learn how to sift through the biases of investigators, the press, and others in a quest to critically evaluate the question. To be honest, five years after you are through with this class it is doubtful you would remember all the details of metabolism. However, you will know where to look and maybe a little about the process of science that will allow you to make an informed decision. Will you be a scientist? Yes, in a way. You may not be formally trained as a science major, but you can think critically, solve problems, and have some idea about what science can and cannot do.

The traditional approach for a student to study Biology in school or at home is through reading text book in printed form. Since the rapid growth of information technology, information delivery styles are changing. Nowadays, students are exposed to various electronic information sources such as e-book, CD-ROM and the Internet. In 1996, the Smart School had become one of the seven flagships application of the Multimedia Super Corridor (MSC) project. In 1999, the Smart School project is implemented at ninety pilot schools nation wide that have been given the 'Smart School' status. One of the aims for implementing Smart School in the Malaysian Education System is to produce Malaysian citizens who are knowledgeable and competent in the information age.

Thus the needs for information technology literate population have initiated the using and learning of computer amongst students and teachers in schools. The knowledge and information provided to students are not limited to textbook only but also through various electronic sources. Since the Smart School project was launched, the 'one house one PC' slogan is disseminated now and then by the Ministry of Education. The purpose is to alert the Malaysians families about the importance of learning computer in 21st century. As a result, the students in primary and secondary schools are starting to use computer in their learning process.

Online Interactive Biology Learning System (OIBLS) will be a web-based multimedia learning-teaching project is suitable for any students who is serious about studying and who wants to achieve the best grade possible in Sijil Tinggi Pelajaran Malaysia (STPM) Biology. The programs clear, pertinent and structured delivery will aid understanding and assist the student in developing or confident approaching to answer STPM level questions. The targeted main users of this project are students those who are taking STPM Biology paper and teachers those are teaching the subject.

OIBLS is divided to eight sections: Lessons, Experiments, Tutorials, Search Engine, Links, Chat Room, Game, and Mail. OIBLS provides an interesting learning environment for the students. Text, graphics, animations and presentation in the lessons section are well matched for both students and teachers.

Topics Module

The topics that would be included in the lessons are Life Processes, Green Plants, Humans as Organism, Variation, Inheritance and Evolution which will be divided to its specific sub-topics. This module explains the major principles in STPM Biology with notes on the screen. Attractive pictures and animation accompany these notes. There are tutorials that test the student's:

i) Volume 1 - Life Processes & Green Plants

- Cells & Chromosomes
- Osmosis

ii) Volume 2 – Humans as Organism

- Circulation
- Movement & Growth

iii) Volume 3 - Variation, Inheritance & Evolution

- Meiosis
- Mitosis

Any of the above sub-topics can be selected and there would be a brief lesson.

Experiment Module

This module contains an experiment cover in STPM Biology syllabus to give better understanding on the topics related..

Tutorial Module

This module lets users select questions from the topic they wish to work on. OIBLS will not give any feedback to user until the user clicks on the summit button. Once the user start answering questions, a time will run to show the time taken. User can go back forth and back to answer the question and change answers and change answers before summit the answers.

Search Engine Module

This module allows the user to search the lesson notes in the site. The documents in the site can be search by typing keyword, term, phrase into the search field then the search button is to be pressed to initiate the search process.

Links Module

This module contains links that will bring users to related web pages for further understanding. Content of the links are related to the STPM Biology syllabus.

Chat-room Module

With this chat room, the system able to enhance communication among students, teachers and parents. With this chat room, they can chat and discuss among each other in real time.

Game Module

This module contains an interesting game which will increase the interest of student in learning Biology and also to test their skills as well as their understanding.

Mail

If users wish to tell their friend about this site, it can be done by emailing the page to them. That way, more people will know about this site.

1.3 Aim & Objectives

1.3.1 Aim

This project aims to create an interesting and effective Biology teaching and learning tool for upper secondary level. It is also important to encourage the young generation to get in touch with the computer and information technology thus enhancing computer literacy among students and teachers.

1.3.2 Objectives

The objectives of this project are as follow:

a) To design and develop a web-based multimedia teaching and learning biology system for upper secondary school (STPM students).

b) To develop an effective and interesting learning tool in order to retain their interest and involvement..

c) To create a better learning and teaching approach with the addition of graphics and animation to text.

d) To bring an almost real life atmosphere in the teaching arena.

e) To improve the computer literacy level among students.

f) To exchange knowledge among students over the net.

g) To use audio and visual effects to stimulate the mind and add enhancement to the package.

h) To bring the e-level of education one step further by providing the more effective way of teaching and learning in order to prepare them for greater challenges in the future.

1.4 Project Scope

Several considerations will be made during the development of this project. The main parties that would taken into consideration are the upper secondary school students and upper secondary school teachers. It will also be based on the biology subject syllabus that is being practiced by all schools in Malaysia. This project is being developed for:

a) The upper secondary (Upper 6 and Lower 6) students aged between 18 to 19 years old. It can also be used by A Level students. It is design to make biology learning more interesting and effective. It also to increase the computer literacy among students.

b) Secondary school teachers. It is a teaching tool that can be conducted in classes. It is an advance teaching approach that is going along with the rapid changes in the technology world.

1.5 Assumptions

Several assumptions have been made in order to develop this system:

a) Access to the Internet is available as this is a web-based application which only can be retrieved online from the Internet.

b) Students and teachers have got basic knowledge in handling a computer.

1.6 Limitations

Online Interactive Biology Learning System has certain limitations as follow:

a) This system is meant for upper secondary or specifically STPM students aged between 18-19.

b) The targeted users of this system are students and teachers that visit this web site, which means they must have access to the Internet.

1.7 Report Layout

Chapter 1 - Introduction

This chapter gives an overview of the system. It gives the reader an overall perception of the system proposed.

Chapter 2 - Literature Review

Literature review consists of the various researches done prior to the design and implementation of the application. Decision made on this application will be based on the research results accumulated in this chapter.

Chapter 3 - Methodology

This chapter will discuss the various modules, system properties, architecture, and decisions of the software as well as hardware intended for the development of this application.

Chapter 4 - System Design

System design describes the different designs used during the project development. It covers the Structural Design, Data Flow Diagrams (DFD), and the user interface design.

Chapter 5 - System Implementation

The overview implementation of the application will be thoroughly explained in this chapter. System implementation describes the environment, tools, coding, and development of the individual modules.

Chapter 6 - System Testing

System testing covers the techniques and methods of testing the completed application. All system must go through a series of testing before it is deployed as a fully functional application.

Chapter 7 - System Evaluation

System evaluation is the final chapter whereby the entire application is being evaluated. This chapter outlines the strengths and weakness of this application. Suggestions of future enhancements of this application will be given. Lists of problems faced during implementation and experiences gained throughout the project would also be included.

1.8 Project Schedule

Month	June				July				Aug				Sept				Oct				Nov				Dec				Jan				Feb			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Feasibility Study																																				
System Definition																																				
System Analysis																																				
System Design																																				
Report																																				
Coding																																				
System Documentation																																				
Testing & Review																																				
Presentation																																				

Figure 1.1: Gantt Chart showing the starting and ending for each activity in the project

Chapter 2 - Literature Review

2.1 Purpose

The background study about the knowledge and information gained to develop this project is the meaning of literature review. Through this, we can get a better understanding on the development tools that can be used to develop a project. We can also get a better idea on the development methodologies used while developing a project. Besides that, it allows the developer to study existing or past-develop projects and find out the weakness and strength of it. From there developers can find solutions to curb the weaknesses and improve the existing strength of these projects to make sure that the project that is to be developed is of high quality.

References, related article and journals, existing interactive multimedia software in the market, and existing online web-based learning application have been analyzed to gain the necessary information. These information are important to ensure that the proposed system is much better compared to the existing ones. It is very important that the same weaknesses will not be repeated in the new proposed system.

2.2 What is Web-based learning?

2.2.1 An Overview of Web-based learning

Web-based learning (a major subcomponent of the broader term "e-learning") is one of the tools with which education is delivered. In traditional academic institutions, web-based learning systems are generally housed administratively in a "distance education" department alongside other at-distance delivery methods such as correspondence, satellite broadcast, two way videoconferencing, videotape and CD-ROM/DVD delivery

systems. All such systems seek to serve learners at some distance from their learning facilitator. Many such systems attempt to serve learners interacting with the learning source at different chronological times (for example, email). Distance Education, then, is often referred to as those delivery modalities that seek to reduce the barriers of time and space to learning, thus the frequently used phrase "anytime, anywhere learning".

The simplest definition of Web-based learning is the delivery of interactive training or education over the Internet or Intranet. It is the structured transfer of skill or knowledge that takes place using the World Wide Web as the distribution channel. The way this interactive learning is designed and implemented varies greatly. A full service learning community offering will likely have to support many approaches to on-line learning design and delivery.

2.2.2 Advantages of Web-based learning

a) Geographic independence - in a Web-based classroom, learning is no longer restricted to the physical buildings of the learning institutions, and the problem of overcrowding start to disappear.

b) Temporal independence - learners can study when it is convenient and when they are free. There is no longer any need for the teacher and learners to synchronize their timetables and meet at the same place and time. There is no longer any reasons for a learner to miss a class.

c) Computer-mediated - all information and communication in a Web-based classroom passes through or is stored in a Web-based classroom can be changed at any time and become available to the learners immediately.

d) Increased communication - the Web allows learners to talk with each other, individually or as a group, and to send questions or hold discussion with their instructor. Indeed, it is commonly reported that people will "talk" more electronically than they do in a face-to-face situation.

e) Learn in a convenient location and at their own pace - using internet, distance learning can take place in many convenient locations, such as office or home or anywhere with access to internet. This is means that people can take the course more conveniently. Learners can take a course during a traditional term or training sessions, or they can take their time to complete learning activities. They can go over materials whenever it is convenient for them

f) Effectiveness and retention - In an independent study done as shown in the following, students normally lost 87% of what they have learnt within a month. It is human nature to learn by repetition. As a result, Web-based learning can allow you to refresh or repeat as many times as you like until you master the material before you move on to the next topics.

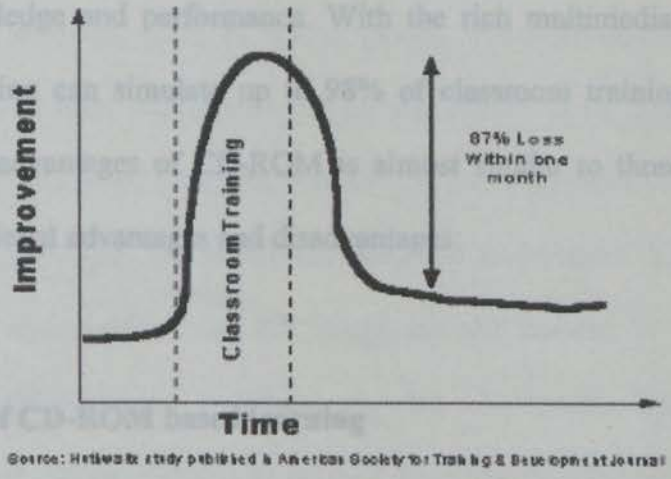


Figure 2.1: Learning improvement against time

2.2.3 Disadvantages of Web-based learning

a) Web-based distance learning has different set of cost associated with it than the traditional classroom. These cost include purchase or implementation of Web-based delivery platform. The cost associated with server support , and additional instructor time required to lead an online course.

b) Online course often only deliver information rather than foster the kind of interaction that leads to effective learning normally only delivery information but not delivery learning.

c) Web material can't identify individual student problem - although web-based learning today is that it can reach large numbers of students, it can't identify individual problems.

2.3 What is CD-ROM based learning?

It refers to the use of CD-ROM based technologies to deliver a broad array of solutions that enhance knowledge and performance. With the rich multimedia capability, CD-COM Based Learning can simulate up to 98% of classroom training. Basically, the advantages and disadvantages of CD-ROM is almost similar to those of Web-based. Below are the additional advantages and disadvantages:

2.3.1 Advantages of CD-ROM based learning

a) The cost to produce a CD is inexpensive. With the wide usage of CD, the price of a CD-ROM package available in the market is very cheap.

b) Do not need a network connection. A CD drive on a normal PC is sufficient.

2.3.2 Disadvantages of CD-ROM based learning

a) Information stored in a CD is static and cannot be changed or updated. Therefore, the developer needs to be sure about the content that will be included in the CD. If changes or additional information needs to be done, a new CD must be produced.

b) No form of communication. Users cannot interact or have discussion with anybody.

2.4 What is Multimedia?

Multimedia is not a single technology. Multimedia stands for the convergence of several streams of development in the computing, audio, video, and communication industries. The term "multimedia" is often used but hard to define. As a buzzword, it is used to advertise different products such as video games, computer-based training, sales presentations, etc. Basically, multimedia can be understood as the integration of more than one medium. In this broad interpretation, current media systems of our society such as newspapers and television fall within the scope of multimedia. The integration of static media such as text, graphics, and still images are well known.

The term multimedia has become somewhat of a trendy, hyped word in the present computer age. When distilled to its root elements its meaning can be devised: *multi* ('much' or 'many') and *media* (from *medium* meaning 'means of communicating').

Using multimedia, then, is simply using a variety of media, whether visual or auditory, with the intent of communicating. Computers have become such a pervasive force because of their unique ability to help humans organize information, and to that end, communicate more effectively. With today's inexpensive, powerful personal computers and many easy-to-use authoring languages, multimedia production has never been more accessible.

2.4.1 Typical Multimedia Application Areas

The spectrum of multimedia development tools can be further subdivided into three typical multimedia application areas:

a) Text-Based Applications

b) Interactive Applications

c) Wide-Area Applications

Depending on the application which is to be developed, what information is to be conveyed, who the audience will be, and how much interaction there will be between the application and the user, an appropriate tool can be chosen. Some of the typical multimedia applications areas, and the specific packages which would cater to each development area are discussed below.

a) Text-Based Applications

Many multimedia applications provide efficient navigation through a large resource of primarily text-based information. These applications need to be searchable so that relevant information can be found easily and quickly. Development tools which cater to

this type of application generally provide hypertext capabilities. Hypertext is similar to regular text, except that it contains information pointing to another point in an application. Microsoft Windows Help is an example of a hypertext, searching program. Some form of an overview, table of contents, or map of the information available in such an application helps the user to navigate efficiently. These applications can also often handle embedded images, sounds, and movies, which make them true multimedia applications.

There are specific tools which provide good development environments for text-intensive applications. Microsoft's Multimedia Viewer 2.0 is a sophisticated information viewer with multimedia, hypertext, and sophisticated search capabilities. Adobe Acrobat is another text-based package which is hypertext-capable, but has limited search capabilities. Both of these packages provide an overview of the content, to guide the reader through the maze of information, and allow importing existing word processor documents. All multimedia applications are capable of storing text and moving through quantities of it, but some tools are specifically designed to work more efficiently with large volumes of it.

b) Interactive Applications

The majority of multimedia applications fall into the category of interactive, graphical applications. These tools are fully capable multimedia tools which can handle all media formats, as well as providing interactivity with the user. This is often desirable in an education setting as it provides the ability to allow specific feedback to a user, keep track of results, and customize the application to a specific user as a function of

responses. Although most tools provide these capabilities, some are better suited to complicated, interactive applications than others.

The level of sophistication of graphical, interactive applications is often related to their cost. IconAuthor 4.0.2 from AimTech Corporation, Authorware Professional 2.0.1 from Macromedia, the Apple Media Tool and Programming Environment from Apple, and Course Builder 4.0.9 from Discovery Systems are four professional-quality, sophisticated multimedia packages, but are also quite expensive. Development packages like Asymetrix Corp's Multimedia ToolBook 3.0, and Claris Corp's Hypercard 2.2 are very capable development tools which cost significantly less. The goals of the multimedia project must provide the specific criteria for choosing between several development tool alternatives. This often requires first-hand experience with the development environment to assess the tool's capabilities and example applications.

c) Wide-Area Applications

A new area of multimedia applications is emerging with the purpose of providing information to an audience over a wide geographical area. This is in part being made possible via the Internet in conjunction with new technologies such as the World Wide Web (WWW) and Mosaic. These new technologies compose an information distribution system providing services to 10-20 million people from commercial and academic organizations. Mosaic is a WWW browser, and is capable of retrieving information from all over the world via the Internet in the form of text, graphics, sounds, and movies. One of the important capabilities of the World Wide Web is its support of hypertext, which allows users to maneuver quickly from one WWW site to another with the click of a button. There is an enormous wealth of information available on the Internet, and

contributing to this body of information is, in essence, providing multimedia access to information. One of the serious drawbacks of this wide-area technology is its lack of organization. There is a tremendous amount of information available, but finding information you are interested in can be difficult. If a multimedia application is to be implemented with a geographically diverse, academic audience as its recipients, this technology is very suitable.

Information is made accessible on the World Wide Web using a mark-up language called HTML (HyperText Markup Language). This language provides the common protocol for providing rich-formatted text, embedded graphics, sounds, movies, and hypertext. More recently there has been the development of image map, and forms fill-out technology. Image mapping allows selected regions on an image to contain links which, when clicked, take the user to another document. The fill-out forms function allows user feedback through fields, buttons, and drop-down menus. This information is relayed to the originating server where it is subsequently processed. To provide documents on the Internet with these capabilities requires setting up a World Wide Web server, and composing documents in HTML. One of the tremendous benefits of this system is that a user can gather information free of charge, as long as Internet access exists. The cost to the information provider is the hardware cost of the server itself, and the time devoted to creating and updating HTML documents. This is quickly becoming the standard method for providing many types of information to a wide-area audience.

2.5 Interactive Multimedia

2.5.1 What is Interactive Multimedia?

Interactive multimedia has been called a "hybrid technology." It combines the storage and retrieval capabilities of computer database technology with advanced tools for viewing and manipulating these materials. Multimedia has a lot of different connotations, and definitions vary depending on the context. Interactive multimedia is defined by these three criteria:

- Interactive Multimedia is any package of materials that includes some combination of texts, graphics, still images, animation, video, and audio;
- These materials are packaged, integrated, and linked together in some way that offers users the ability to browse, navigate and analyze these materials through various searching and indexing features, as well as the capacity to annotate or personalize these materials;
- Interactive multimedia is always "reader-centered." In interactive multimedia, the reader controls the experience of reading the material by being able to select among multiple choices, choosing unique paths and sequences through the materials. One of the key features of interactive multimedia is the ability to navigate through material in whatever ways are most meaningful for individual users.

Interactive multimedia is synonymous with another frequently used term: hypermedia. Hypermedia is the multimedia version of the term hypertext. A hypertext is defined as any non-sequential, electronic text, assembled not as a seamless sequence of material with a beginning, middle and end, but as a web of interrelated "chunks" of text. In a

hypertext, the reader controls the sequence of reading by choosing how to navigate among these chunks of text by various electronic links.

The term hypermedia was coined to mean a hypertext that uses multiple media. In other words, hypermedia is a collection of multimedia materials with multiple possible arrangements and sequences. Hypertext and hypermedia are "electronic" concepts that can only exist in a computer-based environment. Only in a computer-based environment can materials can be linked and organized in multiple ways simultaneously, and searched, sorted and navigated in hundreds of possible combinations by different users.

2.5.2 Why use interactive multimedia?

We've seen that interactive multimedia, by definition, has the capacity to deliver large amounts of materials in multiple forms, and to deliver them in an integrated environment that allows users to control the reading and viewing experience. How then do these defining characteristics and virtues translate into benefits in an educational environment?

First of all, multimedia programs bring to education the extraordinary storage and delivery capabilities of computerized material. This is especially important for schools, libraries, and learning institutions where books are difficult to obtain and update. Multimedia is a powerful and efficient source for acquiring learning resources. Multimedia can also provide educational institutions access to other kinds of inaccessible materials, such as hard to find historical films, rare sound recordings of famous speeches, illustrations from difficult to obtain periodicals, and so on. Multimedia

can put primary and secondary source materials at the fingertips of users in even the remotest locations from major research facilities.

Secondly, it is not just sheer access to these materials that makes multimedia a powerful tool, but the control over those materials that it gives to its users. Interactive multimedia programs enable the user to manipulate these materials through a wide variety of powerful linking, sorting, searching and annotating activities. Each of these activities can be made to reinforce and inculcate various intellectual skills, in addition to satisfying certain cognitive needs for quality learning, such as the ability to follow through links at the immediate moment when curiosity is aroused, and the ability to view different forms of the same information side-by-side.

Furthermore, interactive multimedia programs usually integrate some combination of orientation tools, such as timelines, graphs, glossaries, and other pedagogical guides. These kinds of tools further point to the third major benefit of multimedia: the personalization or individualization of the learning experience.

By allowing users to control the sequence and the pacing of the materials, multimedia packages facilitate greater individualization in learning, allowing students to proceed at their own pace in a tailored learning environment. Furthermore, interactive multimedia can be a powerful learning and teaching tool because it engages multiple senses. Students using multimedia are reading, seeing, hearing, and actively manipulating materials. As one educator enthusiastically put it,

As humans, we seem hard-wired for multiple inputs. Consider that we remember only about 10% of what we read; 20%, if we hear it; %30, if we can see visuals related to what we're hearing; %50, if we watch someone do something while explaining it; but almost 90%, if we do the job ourselves. In other words, interactive multimedia if

properly developed and properly implemented, could revolutionize education. *(Menn, 1993)*

Although "revolutionize" may be a bit optimistic, interactive multimedia is a promising medium for reinforcing, extending, and "supplementing" what goes on in the classroom with print materials, lectures and classroom discussions.

Incorporating multimedia into the curriculum does not mean "throwing out the printed books." Most teachers who incorporate some kind of interactive multimedia into their teaching do so to enhance printed materials and the core course content.

Multimedia materials help students and teachers by way of reinforcement and extension, not substitution. What hypermedia provides is access to materials and unique personalized control over them. In other words, interactive multimedia isn't about replacing books, but about replacing the absence of books; hypermedia doesn't do what books do, but what books can't do.

2.5.3 Types of media included to create a multimedia production

Every once in a while a new tool is developed that can have great impact on the way things are. Interactive multimedia is such a tool. Yet the elements used in multimedia have all existed before. Multimedia simply combines these elements into a powerful new tool. Interactive multimedia can weave five basic types of media into a multimedia production:

Text

Out of all of the elements, text has the most impact on the quality of the multimedia title. Generally, text provides the important information. But too much text on a page can be a detriment. Readers will soon head for the nearest exit button. About 4 or 5 sentences per

screen works well. Text acts as the keystone tying all of the other media elements together whereas a picture is only worth a thousand words. It is well written text that makes a production wonderful. Suddenly, editing becomes more than an exercise, it becomes a necessity.

Graphics

Graphics provide the most creative possibilities for a title. They can be photographs, drawings, graphs from a spreadsheet, pictures from CD-ROM, or something pulled from the Internet. (within the boundaries of the copyright law.) With a scanner, hand-drawn work can be included. In developing a multimedia system the selection of the graphic is crucial. The graphic should complement the text on the page. By searching for the best graphic a whole new sense of visual literacy can be developed.

Sound

Sound is probably the most misunderstood part of a multimedia title. Sometimes sound is being neglected because it is thought that sound is unnecessary. Sound can be used to provide emphasis or highlight a transition from one page to another. A project on India demands a few bars of northern classical sarod music. With the insertion of the sarod music in the project, it would be easier to achieve the purpose of this project.

Animations

Animations are primarily used to demonstrate an idea or illustrate a concept. Video is usually taken from life, whereas animations are based on drawings. There are two types of animation: Cel based and Object based. Cel based animation consists of multiple drawings, each one a little different from the others. When shown in rapid sequence, the

drawing appear to move. Cel animation can be used to show, for example, how an engine's crankshaft works. Object based animation (also called slide or path animation) simply moves an object across a screen. The object itself does not change. Object animation can be used to illustrate a point - imagine a battle map of Gettysburg where troop movement is represented by sliding arrows.

Video

When it comes to making an impact, video is right there at the top of the list. It takes a lot of computing power to incorporate video into a production, but it takes even more visual skill. Great ideas can be found by analyzing the videos shown on television. The video shown must captured, edited, compressed and stored. A video file is an expensive resource. It can take up a huge amount of space on a hard drive. The images must tell their story quickly, yet -completely.

When combined in a clear and organized manner, the final production - called a title - becomes interactive. A reader can choose what to investigate next. An interactive multimedia title is not linear. You don't start on page one and read to the end. An interactive multimedia title is more like a spider's web, with one idea linked to another, allowing choices in the reader's path.

2.5.4 The Components of Interactive Multimedia

Below are the separate components of Interactive Multimedia:

Computer Assisted Instruction (CAI)

Computer Based Instruction (CBI) employs computer technology to assist the instructor to instruct or the guide the learning program of individual students. Its main components consist of CAI and CMI, each of which may employ a variety of media. Computer Assisted Instruction employs instruction modes of tutorial, review and practice and simulation.

Computer Managed Instruction (CMI)

Computer Managed Instruction includes diagnostic assessment and prescriptive study assignments.

Static Visual Displays (SVD)

These are often called visuals or graphics. Their function is to provide a non-text based representation of some object, process, concept or skill to be learned, although they are often accompanied by text. They do not move through space or time and vary in the amount of detail and realism they contain, from a simple line drawing created with a draw/paint program to a photograph.

Audio

Audio broadcasts information or data in a format which can be heard and may include instruction which is redundant with text or unique. It may also include warning sounds and sounds which are used to determine the state of things, for example a badly-tuned automobile engine.

Screen Design/Color

Screen design refers to how information is spatially organized for presentation to the learner. Some separate screen design issues are the use and placements of fonts, color and numerous design issues such as balance, borders, and so forth. Color has been the object of numerous studies dating back to the middle of the century.

Animation (Dynamic Visual Displays)

Animations are visual images which represent motion through space or time. Like SVDs, they may vary in the amount of detail and realism they contain, from a simple line drawings through to video. They are usually created using special authoring software, such as Authorware, Director. Alternatively, they may be video sequences which have been captured in analog or digital format. The set of motion visuals that includes animation and video has been called dynamic visual displays *(Park & Hopkins, 1993).*

Multi-Channel Learning

Interactive multimedia enables simultaneous delivery of instruction via several senses or channels. It might appear that the same information, delivered through multiple channels simultaneously (e.g., visual and audio) would enhance learning in a measurable way.

Navigation

Navigation refers to the process of acquiring information from a rich multi-media database which has no obvious organizational pattern. The World Wide Web is an example of the latter. It is intuitive and attractive to believe that navigation as a learning system will result in significantly better learning than highly structured learning. To

date, there is little research in this area. The conclusion which seem to be emerging is that the effectiveness of navigation cannot be assumed present for all learning situations. While research on navigation is quite new and as yet limited, it is expected to increase dramatically in the next few years.

Instructional Television

Instructional television refers to the use of televised media, whether broadcast, analog tape or videodisc or digital imagery which is employed in an instructional setting to supplement or supplant other forms of instruction. As with other forms of media, ITV originally required massive production facilities, personnel and budgets. With the advent of the transistor, microprocessors and chips, the equipment for capture and editing has become much less expensive and has migrated to the desktop. The basics of good production have remained the same, although styles have been driven by the popular media, styles such as the short sound bite, rapid flashes of imagery, and special graphics effects.

Interactivity

Except for the computer driven by a microprocessor, multimedia are by and large designed for transmission of information about content from a knowledgeable source to the student (information transmission) and is incapable of interaction. There are many definitions of interaction but they generally require that two things be able to carry out activities which elicit a response from one another. Perhaps the highest level of interactivity is a series of activities which result in the student learning or processing information at a cognitive level which is higher than rote memorization.

2.6 Multimedia in Education

In recent years, research activities on uses of computers in schools in western countries such as United States of America and Britain, in particular in K-12 education, have increased greatly. However, the use of computers in education in Malaysian schools is not so promising. Therefore it is very important to create interactive multimedia learning modules suitable for Malaysian school children to encourage the use computers in their education. This is because this is a new learning technique which has growing popularity and efficiency. Besides, it is also to ensure that our young generation is also exposed to current technologies and not just learning the traditional way.

The notion that children learn by constructing their own knowledge is highly popular among educational theorists. Children ought to be active, not passive, in the learning process. They ought to be doing something, not merely watching it. Multimedia technologies offer children the opportunities of learning "actively" by allowing them to construct knowledge as interactive multimedia documents (e.g. multimedia stories).

Definitive research on the positive impacts of multimedia in education has not yet been assembled. While many would argue that the jury is still out, here are some important reasons to utilize this technological tool in education:

- It facilitates student-centered learning allowing choice in the pathways for learning and the rate at which new material is introduced.
- It can address several learning styles and modalities - providing a rich variety of instructional approaches, which can teach in most of the ways that students learn best.
- It motivates student interaction, experimentation, and cooperative learning.

- Students often work together on computer projects as they never did on paper-and-pencil projects.
- It facilitates "storylines" or thematic learning - where a pathway for exploration can easily be woven around a particular concept dynamics.
- It promotes the "constructivist" view of learning.

2.7 Approaches used in gathering information

A system is a collection of objects and activities, plus a description of a relationship that tie the objects and activities together. Typically, a system definition includes, for each activity, a list of inputs required, actions taken, and outputs produced. A system can be developed in different ways. Before developing a system, information about the characteristics and purpose of the system to be developed, the procedures involved to develop the system, and the methodologies used to develop the system need to be gathered. There are many sources which these valuable information can be obtained.

Each source will provide different information and facts depending on the keyword or phrases used to obtain the information. Information can be obtained from system users through survey and questionnaires, the Internet, books, reviews of existing systems, and so on. For the gathering of information to develop OIBLS, the resources includes electronic media, printed media, survey and questionnaires, and guidance from the lecturer.

The Internet which is the electronic media provided a lot information regarding methodologies for the system development, information about the most suitable hardware and software to use, and development tools, Besides that, because OIBLS is a

web-based learning program, examples of existing program is being reviewed to specify the necessary requirements. Various search engines were used in the process of gathering the information namely Google, Yahoo, Altavista, MSN search, and www.whatis.com. The specific keywords used for the search depends on the type of information that I'm looking for.

As for the printed media, books were used to get the details about the development models, authoring tools, and the process of capturing requirements to develop a system.

A survey was carried out to gather information from the end-users which are the upper secondary school students and teachers. The result from the survey was analyzed and will be taken into consideration when developing the system. Besides doing a survey on school students and teachers, a survey on current multimedia biology learning packages was carried out too.

Besides the mentioned above, precious information were also gathered from the guidance of my lecturer, Pn Norazlina Khamis and moderator, Assoc Prof Dr Lee Sai Peck.

2.8 Findings

As mentioned earlier, all the information gathered for OIBLS can be divided into electronic media, printed media, survey and questionnaires, and guidance from the lecturer. Printed media comprises of books while electronic media includes sites which are found on the World Wide Web using specific keywords. Below are all the findings in detail:

2.8.1 Printed Media

a) Inside Adobe Photoshop 5.5

(Authors: Gary David Bouton & Barbara Bouton, Publisher: New Riders Publishing)

This book gave an insight of what Adobe Photoshop is all about. It gives an in-depth understanding of how to create high quality graphics. It also teaches animation, image compositing, and many more to enhance web output.

b) Software Engineering Theory and Practice

(Author: Shari Lawrence Pfleeger, Publisher: Prentice Hall)

This book explains the various types of development models. The steps models were explained thoroughly and it lists out advantages and disadvantages of each models. This book was also referred to understand the process of capturing the requirements to develop OIBLS.

c) Systems Analysis and Design *(Fourth Edition)*

(Authors: Kenneth E. Kendall, Julie E. Kendall, Publisher: Prentice Hall)

This book was referred to understand the Systems Development Life Cycle (SDLC). The information was used to prepare the third and fourth chapter of this proposal.

d) Teach Yourself HTML 4 *(Author: Cottrel Bryant, Pub: IDG Books Worldwide, Inc)*

HTML *(Authors: Thomas A. Powell, Dan Whitworth, Pub: Osborne/McGraw-Hill)*

These two books stated above were used to learn the basics of HTML *(Hypertext Markup Language)* which will be used to develop the web pages.

2.8.2 Survey and Questionnaires

Survey

A survey was done to find the existing interactive multimedia biology learning system existing in the market. The system available can divided into two categories which are CD-ROM based learning and web-based learning.

For CD-ROM learning, there are two systems which have been analyzed:

a) Aircom's GCSE Biology Volume 1: Life Processes and Green.

b) Power CD Biological Science – Cell Biology 1

For Web-based learning, these are examples of sites found on the Internet:

a) http://www.biology.com

b) http://e-juara.com/htm

c) http://dmoz.org/Regional/Europe/United_Kingdom/Education/Secondary/

d) www.kesgrave.suffolk.sch.uk/recentrebshop.html

e) http://www.sebiology.com/education/schpupil_resources.htm

f) http://dmoz.org/Science/Biology/Education/

g) http://www.chalkface.net/pagecopy/subjectitems/revision01.htm

h) http://www.projectalevel.co.uk/biology/

i) http://www.teaching-resource.co.uk/resources/biology.htm

Questionnaires

To gather information from the end user of this system, a survey was conducted in one of the secondary schools in Klang(Sekolah Menengah Methodist (ACS) Klang). A questionnaire was distributed among 50 students. The objective of this survey is to find

out the popularity of web-based learning system among secondary school students. It is also to find out the topics that should be included in the system that would be developed. Here are the questions asked and the results obtained from the survey conducted:

1) How would you rate your rate your interest in Biology?

   a) Interesting(10) b) Boring (10) c) Average (30)

2) How many hours you spent on Biology books a week?

   a) < 3 hours (37) b) 3 – 5 hours (8) c) >5 hours (5)

3) Name frequent Biology sites you visit

4) What information do you usually search for:

   a) Cells (20)

   b) Plants (15)

   c) Anatomy (10)

   d) Nutrition (2)

   e) Photosynthesis (4)

   f) Movement & Growth (8)

5) What is your opinion using internet as at mean to learn Biology.

   a) Useful (13)

   b) Not productive (37)

6) How would you rate doing interactive quiz on Biology.

   a) Eases memorization (14)

   b) Increase understanding (18)

   c) A waste of time (7)

   d) Interesting (11)

7) Do you think having an open discussion on Biology topic on the Internet is worthwhile.

a) Yes (38)

b) No (12)

Charts of the relevant results.

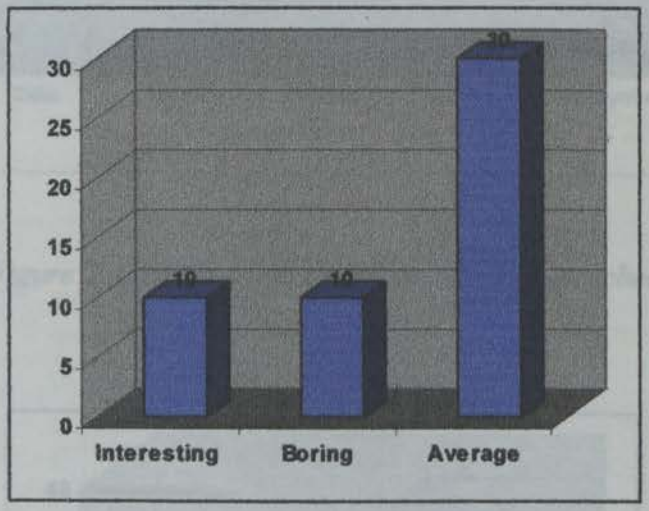


Figure 2.2: Rate of interest in Biology

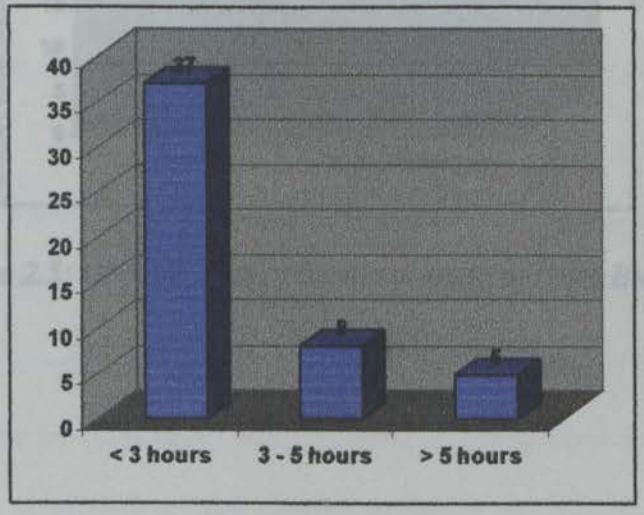


Figure 2.3: Hours spent on Biology books

Frequent Biology sites student visit:

a) www.biolife.com b) www.syum.com c) www.biology.com

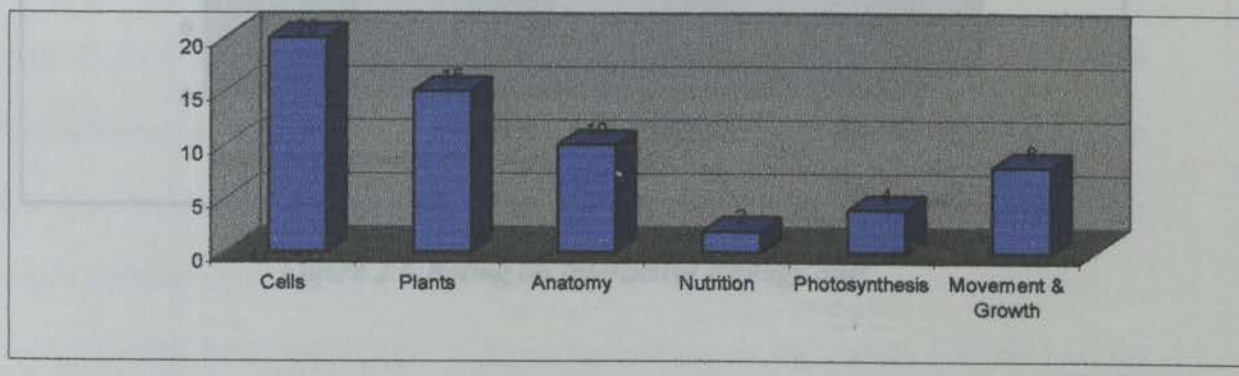


Figure 2.4: Information on lessons usually searched

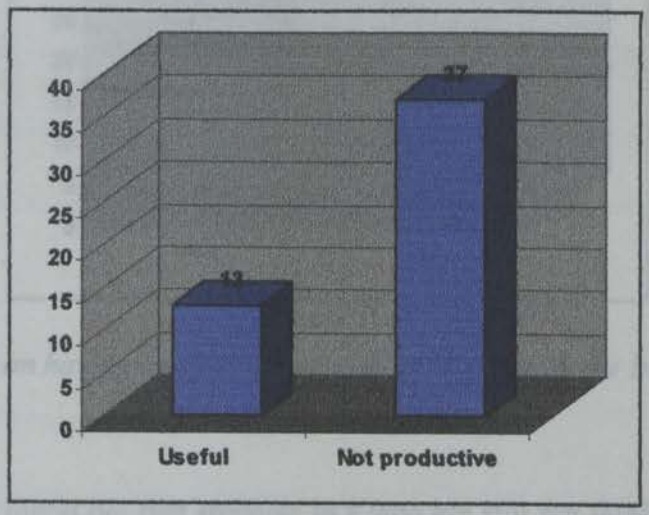


Figure 2.5: Opinion using Internet at mean to learn Biology

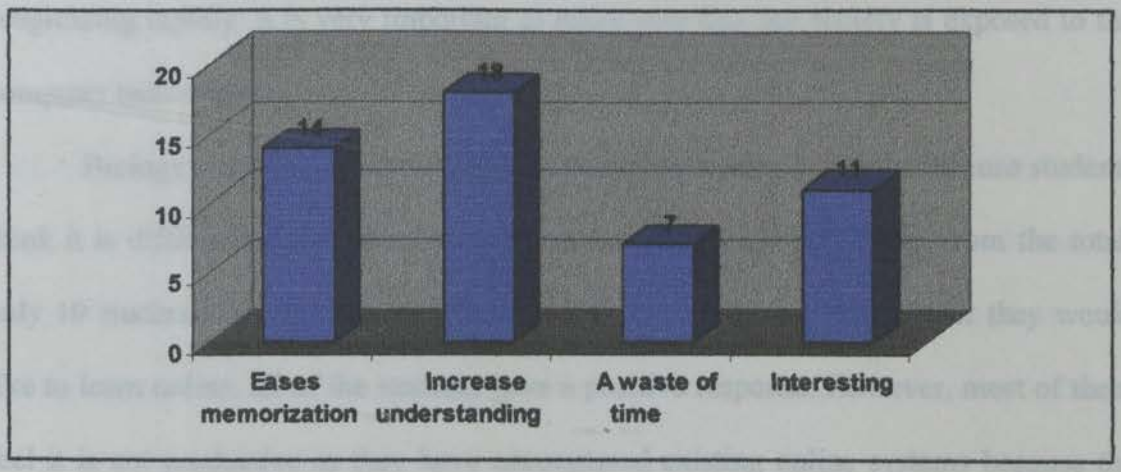


Figure 2.6:Rating on Interactive Biology quiz

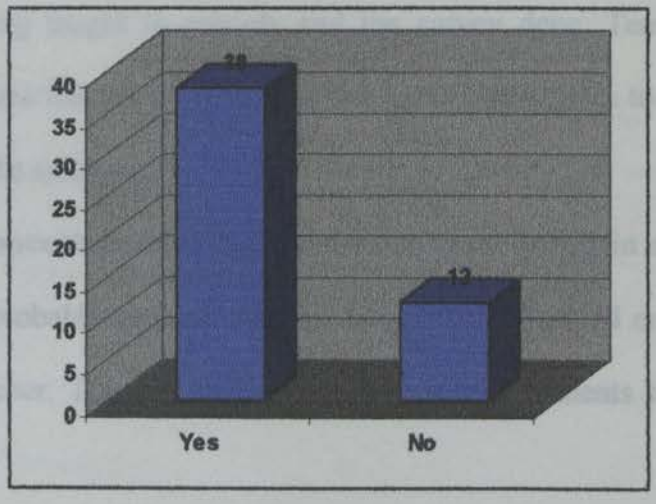


Figure 2.7:Rating on having an open discussion on Biology on the Internet is worthwile

From the results, I found out that students in Klang are still not familiar with web-based learning as out of the total, only a few students came across these learning method before. The rest of the students are still using the traditional method which is from books or through lessons in the classroom. Some of them go for tuitions for extra practice and knowledge. As the popularity of web-based learning is increasing and the technology

progressing rapidly, it is very important to make sure that our society is exposed to the computer technology.

Biology is not the favourite subject among the students. This is because students think it is difficult to understand and lessons in class is not sufficient. From the total, only 10 students find it interesting learning Biology. When asked whether they would like to learn online, all of the students gave a positive response. However, most of them feel it is not productive as they have encountered existing online systems because the topics included are very wide and congested. Therefore, OIBLS should be developed.

As for the subjects that's going to be included in the system, it's based on the syllabus that's being taught in schools and the survey done. Teachers teaching the Biology subject were interviewed and they too agreed that topics to be included in the system should be the syllabus.

The high percentage of students interested participating in an open discussion over the internet probably because they no longer feel pressured or threatened by the presence of a teacher. This also will enable introverted students to participate more freely.

2.8.3 Electronic Media (Internet Search)

Various search engines such as Yahoo, Google, Altavista, etc was used to search for information. Specific keywords based on the type of information needed was used to search the necessary information. Below are the details of some of the sites visited:

2.8.3.1 Sites on Web-based learning and Interactive Multimedia

a) http://www.georgetown.edu/crossroads/mltmedia.html

This site provides all the information about Interactive Multimedia. As OIBLS is an interactive multimedia package, this site is very useful in defining interactive multimedia, why is it used, and the types of multimedia available. It also explains how multimedia can be incorporated into education contexts and the technical requirements for using multimedia.

b) http://www.outreach.utk.edu/weblearning

This site defines web-based learning. It gives descriptions about software tools that are suitable to develop web-based courses and links to existing online courses offered. Articles regarding web-based can also be found here. Issues that should be considered for the development of web-based courses and the explanation of each one are listed here too.

2.8.3.2 Sites on web designing

a) http://tutorials.beginners.co.uk/view/cobrand/searchmiddleware/i/6

This site provide useful tutorials on web developing authoring tools such a Macromedia Flash, Macromedia Dreamweaver, Microsoft FrontPage, and so on. It also provide tutorials on JavaScript, HTML, ASP, Visual Basic, XML, the Internet, networking, web development, web marketing and so on.

b) http://snow.utoronto.ca/Learn2/design.html

This site provides information about web-based instructional design. It provides information about choosing an overall site structure, models of site structure, defining general page layout, preparing course content and resources, developing a communication strategy, developing resources to support learners and much more that's very important in developing a web-based learning system.

c) http://www.lmu.ac.uk/lss/staffsup/desmeth.htm

This site provides a collection of resources to help generate on-line learning materials and references to be installed in the proposed system. Its resources are divided into three categories which are design and delivery, reference tools and guides, and graphics and multimedia. The resources provided include design and methodology for a web-based learning environment, authoring tools, templates and examples, JavaScript basics, usage of sound and videos, etc.

d) http://www.med.monash.edu.au/informatics/techme/authorsoft.htm

This site provides information on what is an authoring tool and considerations to be made when choosing a software. It also lists a number of websites that discusses the issue of selecting the right software to develop a multimedia system. It gives detail explanation regarding certain authoring software such as Authorware, IconAuthor, Toolbook, and Macromedia Director.

e) http://scis.nova.edu/~henkeh/story1.htm

This site is an article about evaluating a Web-based Instruction Design (WBI). It gives the explanation of WBI, describes the importance of WBI, define the design issues, methodology design, top ten web design mistakes, and interface design for a computer-based learning environment.

f) http://www.macromedia.com

This site was surfed to get information about design and development tools such as Dreamweaver 4, Flash 5, Fireworks 4, Authorware, etc.

g) http://www.adobe.com

This site provides the information about web design tools such as Adobe WebCollection, Adobe GoLive, Adobe LiveMotion, Adobe Illustrator, Adobe Photoshop, etc. Adobe AfterEffects, Adobe Premiere, and Adobe Streaming Media Collection are examples of multimedia tools.

2.8.3.3 Sites on development process

a) http://www.med.monash.edu.au/informatics/techme/whyuse.htm

This site gives explanation regarding the phases of development in a development model. It explains in detail two types of development model namely the waterfall model and prototyping.

2.8.4 Guidance from the lecturer

Discussion with the lecturer was done along the process of preparing this proposal to ensure that the content of the system proposed is accurate and relevant. Helpful tips on how to gather the information were given by the lecturer. The lecturer also gave opinions and advice regarding the system design of OIBLS.

2.9 Relational Development Models

There many types of development models. Some are *prescriptions* for the way a system development should progress, and others are *descriptions* of the way system development is done in actuality. In theory, the two kinds of models should be similar or the same, but in practice, they are not. Building a process model and discussing its subprocesses helps the team understand this gap between what should be and what is.

2.9.1 Waterfall Model

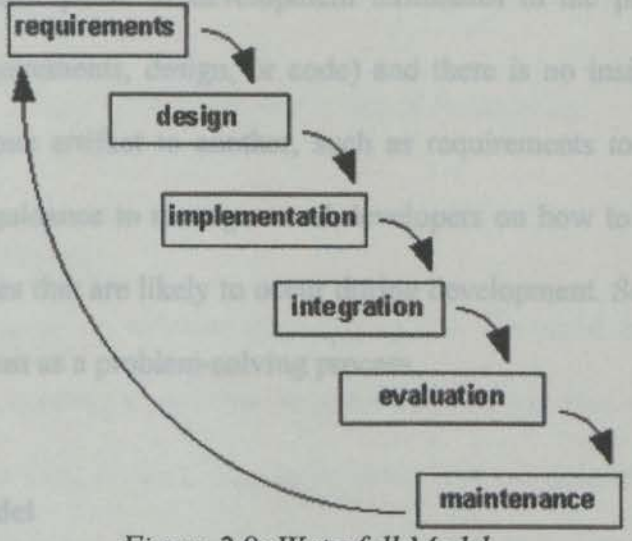


Figure 2.8: Waterfall Model

In a waterfall model, the stages are depicted as cascading from one to another. As the figure implies, one development stage should be completed before the next begins. Thus, when all of the requirements are elicited, analyzed for completeness and consistency, and documented in a requirements document, system design activities will be carried out. The waterfall model presents a very high-level view of what goes on during development, and it suggests to developers the sequence of events they should expect to encounter.

The waterfall model can be very useful in helping developers lay out what they need to do. Its simplicity makes it easy to explain to customers who are not familiar with the system's development; it makes explicit which intermediate products are necessary in order to begin the next stage of development. Many other, more complex models are really just embellishments of the waterfall, incorporating feedback loops and extra activities.

However, there are two major drawbacks concerning the waterfall model. Firstly, it shows how each major phase of development terminates in the production of some artifact (such as requirements, design, or code) and there is no insight into how each activity transforms one artifact to another, such as requirements to design. Thus, the model provides no guidance to managers and developers on how to handle changes to products and activities that are likely to occur during development. Secondly, the model fails to treat the system as a problem-solving process.

2.9.2 Prototype Model

Prototyping methods are considered highly useful for developing educational technology. There are a number of different names being used to describe similar

design/development methods, including prototyping, rapid application development, rapid prototyping and so on. There are two main categories of prototyping technique, as outlined below.

a) Rapid prototyping

Rapid prototyping is used to discover flaws in a design in a short amount of time. The initial design is tested and corrected then tested and corrected again and so on, until a certain level of satisfaction is achieved. Sometimes prototypes are in a much simpler form than the end product- for example paper can be used to prototype a screen design. Other names for this technique include rapid application development. The emphasis is on quick, fast, iterative design.

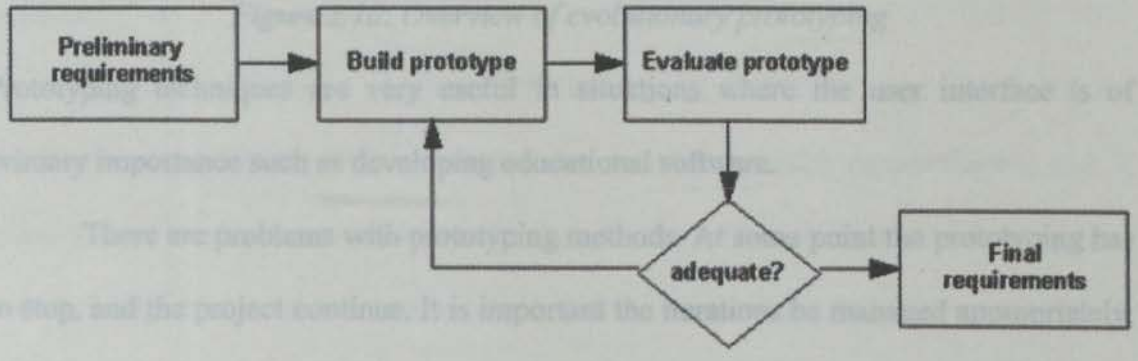


Figure 2.9: Overview of Rapid Prototyping

b) Evolutionary prototyping

Evolutionary prototyping or software prototyping can use rapid techniques, but the emphasis is more on creating a prototype in software, that will (not necessarily rapidly) form the basis of the final product. In a strict sense, once a satisfactory prototype has been created, the project continues on to a more 'waterfall' like method of development.

In reality, the 'stricter' software engineering path is rarely followed when creating interactive multimedia.

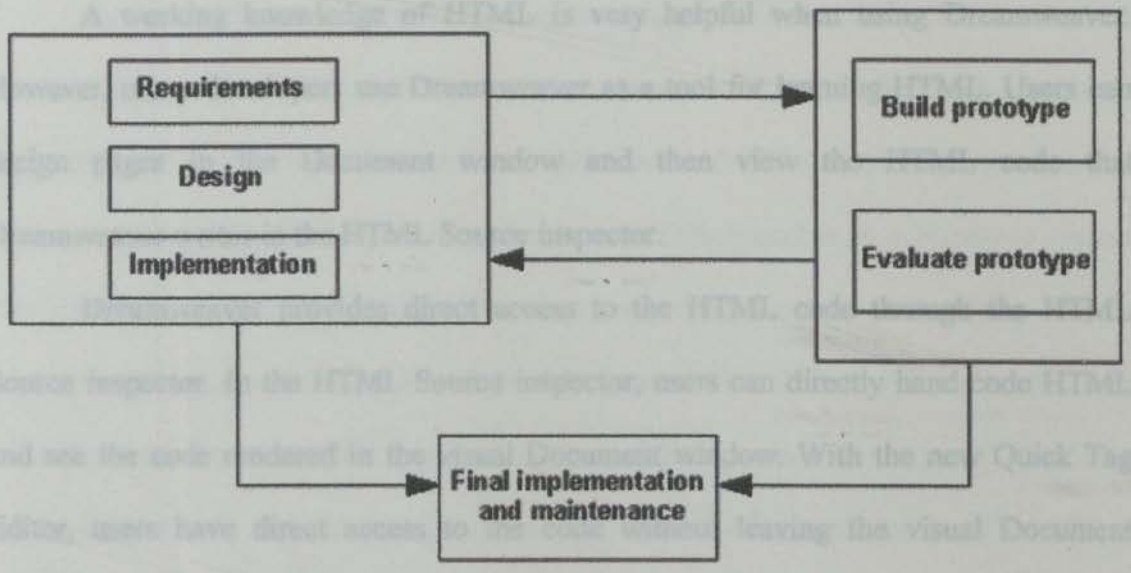


Figure 2.10: Overview of evolutionary prototyping

Prototyping techniques are very useful in situations where the user interface is of primary importance such as developing educational software.

There are problems with prototyping methods. At some point the prototyping has to stop, and the project continue. It is important the iterations be managed appropriately, and not continue on into actual development, where correcting mistakes is difficult and time consuming.

2.10 Relational Authoring Tools and Programming Languages

2.10.1 Macromedia Dreamweaver

Dreamweaver is the professional visual design solution for creating groundbreaking Web sites. Dreamweaver's powerful features allow users to automate production and enhance team efficiency. Dreamweaver facilitates workflow through integration with other Web applications, Microsoft Office, and leading e-commerce and application

servers. Moreover, Dreamweaver can be customized using HTML, JavaScript, and XML for advanced Web site development. Dreamweaver builds better Web sites faster.

A working knowledge of HTML is very helpful when using Dreamweaver. However, many developers use Dreamweaver as a tool for learning HTML. Users can design pages in the Document window and then view the HTML code that Dreamweaver writes in the HTML Source inspector.

Dreamweaver provides direct access to the HTML code through the HTML Source inspector. In the HTML Source inspector, users can directly hand code HTML and see the code rendered in the visual Document window. With the new Quick Tag Editor, users have direct access to the code without leaving the visual Document window.

Dreamweaver writes a subset of HTML 4.0 (for DHTML) and HTML 3.2 for maximum compatibility. Dreamweaver writes JavaScript which ranges from 1 to 1.2, using the most widely compatible code. Dreamweaver Templates allow developers to better manage the overall design of their sites by separating page content from page design. By defining editable areas on a page, developers can restrict changes that can be made to the layout of a particular HTML page. Content contributors can then add and edit content in these editable regions without compromising the site's design. Moreover, changes can be made to the overall design of the site quickly by revising the template file directly.

Dreamweaver Library items allow users to save sections of HTML code from an existing page for later use. These Library items can be added to pages in the site from the Library palette with drag and drop ease. Libraries also make it easier than ever to

update code across many pages, as edits to a Library item will be reflected in all pages that reference it throughout the site.

Authoring pages in Latin-based languages is possible providing that the fonts of that language are available on the system. Dreamweaver 3 on the Macintosh can create pages that use double-byte fonts, such as Japanese and Chinese characters, when the appropriate language kit is installed on the system. Dreamweaver on a Windows system can create pages that use double-byte fonts, provided the user is working on the localized operating system for the desired language. On a Windows system, the user must also have the appropriate localized version of Dreamweaver.

While Dreamweaver is primarily an HTML authoring tool, it allows for editing pages with non-HTML markup languages. Support for ASP, JSP, and CFML is included with built-in data translators. Extended support can be added for editing any non-HTML markup language through extensibility. Dreamweaver permits disabling automatic HTML correction when working on pages which contain non-HTML markup language. Users may wish to consider Dreamweaver UltraDev when working with ASP, JSP, or CFML.

2.10.2 Microsoft Agent Scripting Helper (MASH)

Microsoft® Agent is a set of programmable software services that supports the presentation of interactive animated characters within the Microsoft Windows® interface. Developers can use characters as interactive assistants to introduce, guide, entertain, or otherwise enhance their Web pages or applications in addition to the conventional use of windows, menus, and controls. Microsoft Agent enables software developers and Web authors to incorporate a new form of user interaction, known as

conversational interfaces, that leverages natural aspects of human social communication. In addition to mouse and keyboard input, Microsoft Agent includes optional support for speech recognition so applications can respond to voice commands. Characters can respond using synthesized speech, recorded audio, or text in a cartoon word balloon. The conversational interface approach facilitated by the Microsoft Agent services does not replace conventional graphical user interface (GUI) design. Instead, character interaction can be easily blended with the conventional interface components such as windows, menus, and controls to extend and enhance your application's interface.

MASH is an easy-to-use program that lets you to compose and playback entertaining Microsoft Agent presentations. You can specify what you want them to say and do. MASH is used for these inspiring technologies such as talking websites, interactive presentations, self-running kiosks/demos, tutorials, tour guides, clipboard and text file readers, and just plain fun. It can be used to create presentations for Web Sites, Email Messages, Visual Basic and Office Applications, Windows Scripting Host, or MASH's own Desktop Scripts and Executable programs.

2.10.3 Active Server Pages

Microsoft® Active Server Pages (ASP) is the server-side execution environment in Microsoft Internet Information Server (IIS) 3.0 that enables you to run ActiveX™ scripts and ActiveX server components on the server. By combining scripts and components, developers can create dynamic content and powerful Web-based applications easily.

Web pages that are customized for each user on the fly, based upon their actions or requests. For example, new visitors to your site can be shown a different welcome page than returning users see, or pages in an online catalog can be queries to a database so customers always see the most current information and availability.

Organizations will use the Active Server Pages technology to put a Web front end on existing business solutions, or to create entirely new Web-based applications. Since ASP provides a very open development environment, with support for both Microsoft Visual Basic®, Scripting Edition (VBScript) and JScript™, organizations can leverage the investments they already have in these scripting languages.

2.10.4 HTML

Hyper-Text Mark-up Language (or HTML for short) is the language used to specify the construction of Web pages. Web pages are a form of HyperText and include text, graphics and links to other HTML documents.

Web pages are stored as standard ASCII (American Standard Code for Information Interchange) files. Web pages may be viewed by a variety of different Web browsing tools, each of which may have different abilities. However, since Web pages are text files, each Web browser can read it and format the document in accordance with its abilities.

HTML is a standard which enables you to request a Web browser to format and display your Web page in a particular way. HTML allows you to mark areas of your document that will become for example: titles, new paragraphs or italic text. Since the

Web page is specified as an ASCII file the codes or "elements" (as they are known) have also to be ASCII.

The elements can broadly be divided into two main categories: those that describe the format of the Web document, i.e. what it looks like, and those that define information about the document, i.e. its title.

2.10.5 JavaScript

JavaScript is a general-purpose programming language designed to let programmers of all skill levels control the behavior of software objects. The language is used most widely today in Web browsers whose software objects tend to represent a variety of HTML elements in a document and the document itself. But the language can be and is used with other kinds of objects in other environments. For example, Adobe Acrobat Forms uses JavaScript as its underlying scripting language to glue together objects that are unique to the forms generated by Adobe Acrobat. Therefore, it is important to distinguish JavaScript, the language, from the objects it can communicate with in any particular environment. When used for Web documents, the scripts go directly inside the HTML documents and are downloaded to the browser with the rest of the HTML tags and content.

How is JavaScript different from Java?

JavaScript was developed by Brendan Eich of Netscape; Java was developed at Sun Microsystems. While the two languages share some common syntax, they were developed independently of each other and for different audiences. Java is a full-fledged programming language tailored for network computing; it includes hundreds of its own objects, including objects for creating user interfaces that appear in Java applets (in Web

browsers) or standalone Java applications. In contrast, JavaScript relies on whatever environment it's operating in for the user interface, such as a Web document's form elements.

JavaScript was initially called LiveScript at Netscape while it was under development. A licensing deal between Netscape and Sun at the last minute let Netscape plug the "Java" name into the name of its scripting language. Programmers use entirely different tools for Java and JavaScript. It is also not uncommon for a programmer of one language to be ignorant of the other. The two languages don't rely on each other and are intended for different purposes. In some ways, the "Java" name on JavaScript has confused the world's understanding of the differences between the two. On the other hand, JavaScript is much easier to learn than Java and can offer a gentle introduction for newcomers who want to graduate to Java and the kinds of applications you can develop with it.

2.10.6 Adobe Photoshop

As the industry standard for digital image manipulation software, Adobe Photoshop has revolutionized the photography and prepress industries and has provided commercial and fine artists with an exciting new medium for photographic editing. Adobe has integrated into Photoshop a design based upon traditional photo manipulation technique, where tools and processes directly correspond with those used in `physical' photography. Photoshop introduces features and enhancements which go far beyond the capabilities of the darkroom technician, thanks to digital technology; yet through an interface based on traditional technique, Adobe ensures a relevant, familiar, but powerful program environment.

Pixels

With all the talk of bitmapping and rasterization, it should be somewhat clear now that the primary unit in Photoshop is the pixel, where each pixel represents a unit of color information (hue, saturation and brightness). With the exception of **floating selections**, all changes in Photoshop occur at a two-dimensional level; dragging the paintbrush across a picture causes the replacement of those pixels in its path with new ones. The only way in which to recover the replaced pixels at this point is to choose the Undo or Revert commands or by using the Rubber Stamp/Eraser tools with their From Saved options.

Selections

Selections in Photoshop work similarly to the same function in most other Mac applications, where selections can be copied, cut, pasted, and cleared. While changes can be made to a picture as a whole, selecting a certain area first restricts changes inflicted through a filter or other editing command to the selected area only. The rest of the picture is protected. Three tools handle the task of selecting: the Marquee tool, which enables the simple box/rectangle method of selection; the Lasso tool, which enables the user to section off portions of the picture in a free-hand manner; and the Magic Wand tool, which uses the intelligence of the computer to make selections based on pixel color similarity, the parameters of which are defined by the user.

Once a selection is created, it can be dragged to another place in the picture or layer, Option-dragged (copying and dragging the copied selection), copied and pasted to another picture altogether, edited, deleted-you name it. The important thing to remember, however, is that once deselected, the object replaces those pixels beneath it; they are forever lost, save through the revert procedures mentioned above.

Layers

The closest Photoshop comes to the versatility afforded object-based software is through the use of layers, which are not unlike cells used in the physical graphics industry. An indefinite number of layers can be created, accessed, stacked, or deleted using the *Layers* palette, available under the Windows/Palette menu. Each picture automatically contains a background layer; the currently highlighted layer on the Layers palette is considered the *target layer*, which is the only editable layer at any given time. Areas on a layer containing image data contain pixels, which are opaque; areas *without* image data (and thus pixels) are transparent, so that underlying layers show through. The advantage to this feature is the ability it gives the artist to designate and seperate components of the composite picture, and then edit them individually without effecting the other layers.

Channels and Modes

Each Photoshop document is considered in terms of one or more channels depending upon the mode; in RGB mode, there are three color channels (one each for Red, Blue and Green) and a fourth composite channel. If the user selects any one of these color channels from the **Channels** palette, the document window reflects a greyed-out version of the image; note that different areas of grey are more/less intense depending on which color channel is selected. These gray images reflect intensity values of that particular basic color in any area of the image: in the case of *additive* color, lighter areas reflect the presence of that isolated color (as in the RGB color model); for *subtractive* colors, the opposite is true, where lighter areas in the isolated channel indicate an absence of the channel's color and darker areas.

Color modes, as discussed earlier, are the various ways in which image data can be considered by Photoshop; the three most common examples are RGB color (consisting of three channels, Red, Blue, and Green), CMYK color (Cyan, Magenta, Yellow, and Black), and Grayscale (a single channel of Black). Modes and channels are in some ways the most complex elements of Photoshop. The more complex the color/image data (i.e., the more channels a picture is working with), the greater the file size, as Photoshop interprets all data in terms of its channels. Thus, a picture saved in the RGB mode will be *three times* the size of a Grayscale image; likewise, a CMYK image will be four times as large.

2.10.7 Microsoft Access 2000

Access is a database platform which makes it possible to develop database-integrated ASP web sites. Because all the information in an Access database is contained in a single file, it is easy to upload or download the entire database over FTP or the web.

Access allows the user to link together data stored in more than one file. It stores information in an easily retrievable form. It can store information such as text, numbers, dates, currency, pictures, and sounds. As well as being able to store data, it allows information to be selected easily and quickly. The summaries of the information selected can also be printed.

These are the important things that should be considered when setting up a database:

- type of information that needs to be stored
- type of information that needs to be retrieved
- who the data is intended for and how other users will use it

- whether certain parts of the data is restricted to certain users only
- who is allowed to change or add data
- If the data refers to actual people, it may need to be registered under the *Data Protection Act*

2.10.8 Microsoft Personal Web Server

Personal Web Server transmits information in Hypertext Markup Language (HTML) pages by using the Hypertext Transport Protocol (HTTP). It provides most of the functionality of Microsoft Internet Information Server, including the ability to:

- Publish Web pages on the Internet or over a LAN on an intranet.
- Support Microsoft ActiveX programs.
- Transmit or receive files by using the FTP service.

Typical Problems of PWS on Win9x

There are a handful of common PWS problems which can prevent proper operation of UltraDev's Live Data Preview feature.

When experiencing problems while testing a Web server, check for the following common errors:

- Verify that the file name does not end in .asp. Also, make sure that the test page is not misspelled in the browser address (location) field.
- Make sure the correct path for the page was entered.
- Double check that the VBScript is not missing the delimiters <%...%> or <SCRIPT> tags.
- If the VBScript has errors in syntax, make corrections.
- Check that PWS is running by either looking for its symbol in the system tray or by choosing Start > Programs > Microsoft Personal Web Server > Personal Web Manager. Check the interface to see if the "Stop" button is displayed.
- In some cases, when creating a page after PWS has been running, it is necessary to stop and restart PWS.

2.11 Evaluation on Existing Systems

2.11.1 Web-based learning

a) http://e-juara.com/htm

In this web, the visitor can choose between English or Bahasa Malaysia as the language as the language for viewing the web page. Basically, it has nine features, which one of it is the cyber tuition for PMR and SPM students. Only four subjects are available for both PMR and SPM students, which are "Bahasa Malaysia", "Bahasa Inggeris", Science and Mathematics. In this context, notes and tutorials related to their four subjects are given with complete explanations to guide students in their study process and help them to improve their presentation in school.

Analysis and comments:

Since in Malaysia both Malaysia and English is used widely in the country, this web site provides the visitors with two version of language, one in English and one in Bahasa Malaysia. It is good to have this feature because it will encourage more users to visit the web site. This site has a good user interface compared to many other sites. Thus, visitors might feel comfortable with the navigation in the site.

Anyway, this web has no question bank for students to have test on themselves to know the level of understanding they gained. No search engine can be found to link users to some other web pages. No chat room to improve relationships and communications between users.

Advantages:

- Two version of language.
- simple and easy to use.
- covers various subjects and topics for a wide age group.

Disadvantages:

- no tutorials provided.
- no links
- poor navigation
- due to wide range of subjects available, it doesn't cover mathematics in detail.

b) http://www.biology.com

This site is an ever-expanding resources at The Biology Place created by teams of leading educators in partnership with Peregrine Publishers. The site offers students,

educators, and anyone with a desire to learn about biology the chance to master the key biological principles and processes with the best interactive tutorials on the Web. Users can take practice exams keyed to leading textbooks and investigate biology-related news. The site links to find the most credible and reliable science resources on the Web

.

Advantages:

- covers various topics
- link to many other sites
- tutorials provided

Disadvantages:

- Not appealing - not user friendly
- Congested information
- Experiments take time to load.(use video, which requires shockwave plug in)
- Have to register with the website to use the facilities.

2.11.2 CD-ROM based learning

a) Aircom's GCSE Biology Volume 1: Life Processes and Green.

This is a CD-ROM learning package that is very popular in the current market. Comprehensive delivery of the course material is achieved through dividing the content into eight sections. The student is encouraged to work through each section, rather than rapidly move from one to another, thus maintaining cognitive flow. The text is fully narrated and supported by high quality graphics and 3D animation. Regular test are part of each section. Incorrect answers lead to worked solutions being given.

Advantages:

- provides background music that can be togged on/off.
- very attractive 3D animation and interface.
- focused topics

Disadvantages:

- narration is not good.
- color scheme unappealing
- not user friendly - control not in the hands of user
- icon design of the package is poor
- must complete the test

b) Power CD Biological Science – Cell Biology 1

Power CD Biological Science – Cell Biology 1 is published by Zone Publishing and it focused only one cell biology. This program can run on Windows and Macintosh computers without any installation. At the main menu, users have no choice but to choose the presentation and users can sit back and watch the show. User can click on highlighted text to bring up glossary window. The window will give definition to the word just ditched on.

Generally, this program is an automatic page-turner which is much more expensive than a colourful biological books. This program is suitable for the user who are experienced in biological science and want to know more about cell biology because the explanition text is limited.

Advantages:

- find a word

Disadvantages:

- lack of user control
- no self-test or tutorial questions
- limited graphics
- no animation

Chapter 3 - Methodology

3.1 System Analysis

The definition of system analysis is a systematic investigation of a real or planned system to determine the functions of the system and how they relate to each other and to any other system. Depending on the context and the constraints of the package, developers should be able to clarify the interactive multimedia project rationale, to define the program scope, and to set up methods of evaluation by creating a preliminary analysis.

Typical constraints in the design of an interactive multimedia application include:

- media configuration and performance, e.g. developers might have multi-platform development strategy aimed at producing a good multimedia application
- for the publishing market, or a very tailored approach for a specific purpose – a teaching and learning tool
- the availability of expertise about the subject,
- the accessibility of related multimedia documentation,
- the budget and the deadline.

The look and feel, interface and functionality of existing interactive multimedia applications should be evaluated. It often helps to make a chart of comparative features of existing applications. Looking at these applications will reveal the puzzle that multimedia design and production represents. Production is always governed by the delivery requirements, hardware limitations, storage capacities, and the speed of the programs that present the information. All the existing products analyzed will demonstrate the trade-offs the developers had to deal with in order to bring the project to

the perceived market. The processor speed, the hard disk storage and access, and memory limitations have all been juggled to create the best application for the investment.

3.2 Modeling the Process and Life Cycle

3.2.1 What is a process?

A process is a series of steps involving activities, constraints, and resources that produce an intended output of some kind. A process usually involves a set of tools and techniques and has the following characteristics:

- the process prescribes all of the major process activities.
- the process uses resources, subject to a set of constraints (such as a schedule), and produces intermediate and final product.
- the process may be composed of sub-processes that are linked in some way. The process may be defined as a hierarchy of processes, organized so that each sub-process has its own process model.
- each process activity has entry and exit criteria, so that we know when the activity begins and ends.
- the activities are organized in a sequence, so that it is clear when one activity is performed relative to the other activities.
- every process has a set of guiding principles that explain the goals of each activity.
- constraints or controls may apply to an activity, resource, or product.

When the process involves the building of some product, it is referred as a life cycle. A life cycle usually involves the following stages:

- requirements analysis and definition
- system design
- program design
- writing the programs (program implementation)
- unit testing
- integration testing
- system testing
- system delivery
- maintenance

Below are the reasons for modeling a process:

- it forms a common understanding of the activities, resources, and constraints involve in a system development.
- helps to find inconsistencies, redundancies, and omissions in the process and in its constituent parts. As these problems are noted and corrected, the process becomes more effective and focused on building the final product.
- the model should reflect the goals of development, such as building high-quality system, finding faults early in development, and meeting required budget and schedule constraints.

Every development model includes system requirements as input and a delivered product as output.

3.2.2 Proposed development model for OIBLS

To develop OIBLS, the model chosen is a combination of the waterfall model and the prototype model.

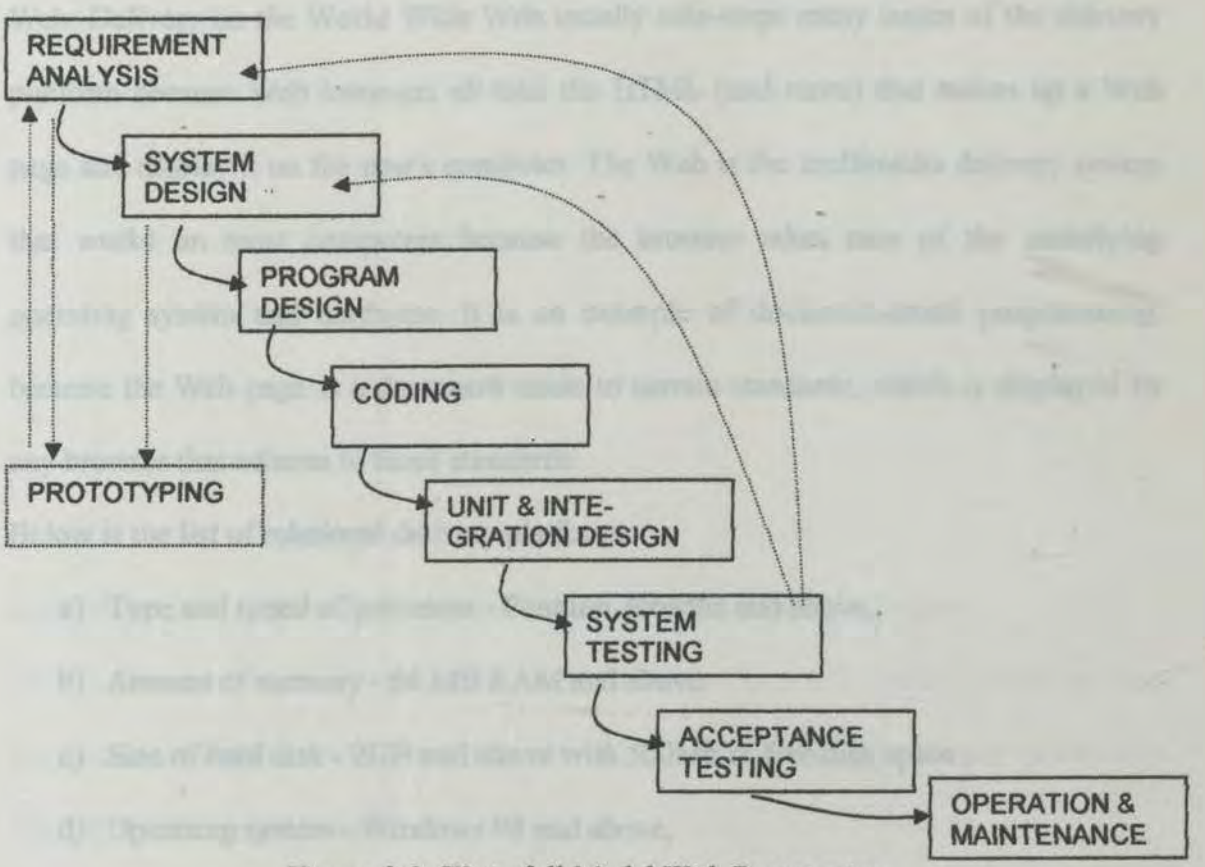


Figure 3.1: Waterfall Model With Prototyping

In a waterfall model, each development stage has to be completed before proceeding to the next. For example, in the first stage all the requirements are elicited, analyzed and documented before designing the system. Overall, this model is a well documented process. With the addition of the prototype model as the sub-process, certain aspects of the system can be reviewed and tested to check its functionality and whether it meets the specific requirements. The means that process can be tailored to meet the specific requirement yet possibly changing needs of any application. This way, major problems can be avoided as errors can be detected at an early stage.

3.3 Delivery Platform and Medium

3.3.1 Delivery platform

As OIBLS is a web-based application, the delivery platform would be the World Wide Web. Delivery on the World Wide Web usually side-steps many issues of the delivery platform because Web browsers all take the HTML (and more) that makes up a Web page and display it on the user's computer. The Web is the multimedia delivery system that works on most computers because the browser takes care of the underlying operating system and hardware. It is an example of document-based programming, because the Web page is a document made to certain standards, which is displayed by any browser that adheres to those standards.

Below is the list of relational delivery platform:

a) Type and speed of processor - Pentium 366Mhz and above;

b) Amount of memory - 64 MB RAM and above

c) Size of hard disk - 2GB and above with 500Mb of free disk space ;

d) Operating system - Windows 98 and above;

e) Access to online systems (local network);

f) Speed of network connection - 56K and above;

g) Resolution of the screen - 800 by 600 pixels;

h) Number of colours on the screen - 256 and above;

i) Sound handling - 8-bit and above.

3.3.2 Delivery medium

Online delivery would be the delivery medium for OIBLS. There are four main issues namely speed of access, distance, updating, 'unlimited' size of the data space that can be provided online.

The speed with which OIBLS's potential users can access the application is unpredictable because it depends on the access speed of the Internet.

Online delivery allows people from all over the world to access the application anytime. All they need is a connection to the Internet. This method overcomes the barrier of time and space. It also provides huge data space that can potentially be presented to the user.

3.3.3 Why OIBLS is made Web-based and not a CD-ROM application

The advantages and disadvantages of Web-based learning and CD-ROM based learning have been discussed earlier in Chapter2. Web-based learning is chosen to develop OIBLS. These are the reasons why:

- OIBLS is a learning and teaching application. Therefore, there is a possibility that the information on the site and stored in the database be updated. Updates on web pages can be done easily whereas information on a CD is static and cannot be changed.
- A web-based application is stored in a server that is connected to a network locally or globally, this allows it be accessed anywhere without the geographical limitations. This has been proven by distance learning programs, which has been introduced by institutions globally. CD-ROM application can only be used if the

users can get hold of the particular CD. This means the usage of the application depends on the distribution of the CD.

- With web-based learning, multiple users can access it simultaneously whereby the teacher and the students' can experienced the interactive learning and teaching environment. One CD can only be used by one user at a time unless the application is saved into the PC which usually takes up a lot of disk space.

3.4 Proposed Development Tools

Below are the tools that will be used for the development of OIBLS. The advantages stated are the reasons why these tools are chosen.

3.4.1 Authoring Tools

3.4.1.1 Macromedia Dreamweaver

Advantages of using Dreamweaver

These are the qualities that makes Dreamweaver different from other high-end Web site tools:

- Roundtrip HTML(tm)
- Customising options and page layout power
- Cross-browser compatibility
- Site management features.

Roundtrip HTML

Most traditional Web page tools are either tag based--good control, but difficult to use--or have a WYSIWYG interface. Tools with a WYSIWYG interface usually create their own "brand" of HTML that doesn't always conform to the World Wide Web

Consortium's HTML standards. So WYSIWYG tools, which shield users from hand editing tags, are convenient and quick to use. HTML purists don't like the HTML these tools produce. Another problem, if more than one editor is used or the pages are worked on by several people using different editors, the source from one falls to bits or is reformatted when it is opened with another. Dreamweaver's Roundtrip HTML(tm) preserves the formatting you set, no matter which source editor you use.

Customising options and page layout power

With Dreamweaver, many things can be customized such as the look of your workspace, your choice of HTML source editor, even the way your HTML source is displayed.

Launcher - Launcher can be used to open and close Dreamweaver's pallets and inspectors. There's a mini launcher at the bottom right edge of the document window. It has the same icons as the launcher, but no labels. Once you get used to the icons, you can dispense with the launcher, freeing valuable desktop workspace for other items.

Object Pallet - This pallet reproduces selections within the Insert menu. It is used to insert page elements. The default groupings for page elements are, Common, Forms and Invisibles. Groupings can be customized in almost any way, from which elements appear in which group to which order groups or elements within a group appear. New objects can be created and added to any group. Objects can be almost any HTML element, such as images, tables, layers, rules, Applets, plugins, forms, scripts, comments, to snippets of code. Once a new object is created and added to the object pallet, it can be added to any page.

Property Inspector - The context sensitive Property Inspector switches dynamically to display the properties of the HTML element that's being worked on. Although it might

not be immediately obvious, this is an extremely useful feature. When the user is working on an image, the Image Property Inspector is displayed. If the user want to edit an image, it can be done visually, using the mouse to select and drag the image dimensions. Or change image dimensions by entering new height and/or width values in the inspector window. When the user is working on text, they can change the font or style by selecting it with the mouse and applying the code they want, they can use the HTML Inspector to edit tags, or call up a preferred external editor with a single click, and change the tags there. Whichever way the change is being made, the document is updated automatically in the other views.

Cross-browser compatibility

There are only two main protagonists in the browser wars, but the range of versions, each with its own feature set, makes designing for cross-browser compatibility a nightmare. Dreamweaver has several features to make this essential task easier.

A target browser, or browsers can be selected. Check a document against the target(s) and a list of tags and/or attributes that are not supported by the target browser(s).will be displayed. Predefined profiles for Netscape Navigator 2.0, 3.0, and 4.0, and Microsoft Internet Explorer 2.0, 3.0, and 4.0, or any combination of these. can be checked

Site management features

Creating a single page is one thing, maintaining a site is another. There are links to check (within pages, within sites and across sites), HTML to tweak, and styles to update. Good sites are internally consistent, consistency helps visitors orient themselves within the site. Changing the way lists are displayed or changing the navigation bar on every page is a pain. Dreamweaver's Target Browser Check and CSE HTML Validator

(bundled with Dreamweaver) help you control and manage your HTML. The Check Link Feature (from the File Menu) checks links for a single document or the entire site.

Library Elements - Library Elements can be bullets, backgrounds, logos, addresses, etc, and all their attributes. The elements are dragged or inserted into the page. Within Dreamweaver, Library Elements are displayed differently from ordinary page elements, but they appear normally in the browser. If a library item is changed, a decision decide whether to have Dreamweaver update all pages right then or later must be made When the site is updated all references to the library item are changed in all pages that contain the item. So it's easy to maintain consistency across the site even when a common style is changed, frequently used e-mail address, or any page element that's being set up as a Library Element.

An individual instance of a Library Element can also be edited. Users will first be reminded that it is a Library Element and asked they want to edit the element or this instance. When editing a single instance, only that instance changes. That item will no longer be linked for automatic updates when the library element is changed.

File Check In/Out - It is useful to be able to identify which files have been checked in/out and by whom, especially if there are problems with data loss and version control, two common hazards when more than one person works on a site.

Layers - If the design is for version 4 browsers, layers can be used to position graphics, text and other HTML objects at specific pixel coordinates. Layer's properties can also be modified--including its size, shape, position, visibility, color and position within a group of layers.

Style Sheets - Styles within a page can be set and controlled--using individual custom styles or style sheets--or across pages (even an entire site) using Library Elements or style sheets. Style sheets can be individual internal styles, placed within the <Head> element of each page, or stand-alone. Stand-alone style sheets are external to individual pages, but linked to the pages to which they apply. Styles are created with the Style Definition Menu and applied to any text in a document. Browsers that don't support styles simply ignore style tags.

JavaScript behaviours - A number of preset behaviours, which include events, for example onClick, onMouseOut, and onMouseOver , and actions, for example, show layer, hide layer, and play sound are built-in to Dreamweaver. Behaviour can be applied to a link, image, form element, layer, almost any HTML element. Just select the element, open the palette, select from the list of events, then select the action desired. Personal customised behaviours can be created and customised if scripting and which events and actions are allowed for different HTML elements and browser versions is understood.

Animation - Very impressive animations can be created by manipulating and combining layers with JavaScript behaviours along a time line. This is one example of what is called Dynamic HTML, or DHTML. Dreamweaver's time-line interface makes it easy to manipulate layers and behaviours, along a time line or time curve. Images can be swapped, sounds added, layer properties changed, even go to another URL within the animation.

3.4.1.2 Microsoft Agent Scripting Helper (MASH)

MASH is used to generate the talking wizard. The output of the presentation can be of many types of formats including VBScript for HTML, JavaScript for HTML, Email Stationery, Visual Basic, VBA for Office documents, and Windows Scripting Host.

As OIBLS is built with HTML and JavaScript, I chose JavaScript for HTML as the output. From the codes generated, I did some modification to increase the capability of the wizard. Control statements are included to make the wizard more responsive.

3.4.2 Programming Languages

3.4.2.1 Active Server Page

Advantages of using Active Server Page

Active Server Pages (ASP) is a component of Microsoft's Web server software that allow user to embed server-side script code in web pages. It is a server side enhancement because all the script code runs on the server. The user can now create web sites that are dynamic and database-driven by using the client side script, Java applets, dynamic HTML, or active X Control.

An Active Server Pages application can integrate with any ODBC-compliant databases including Microsoft SQL Server™, Oracle, Sybase, Informix, and DB2 databases. Any OLE 2 application, such as Lotus Notes or Microsoft Excel, can also be scripted to access or process information. You can also write components to access online data feeds and legacy mainframes.

Following are some of the benefit of Active Server Page.

a) It works with Windows 98 to provide a comprehensive set of technologies that enable secure exchange of information over public networks, access control to server resources and confident identification of server and client.

b) It supplies client / server programming. This can be used to build client / server applications.

c) It is suitable for building multi-tier Internet and intranet applications.

After looking at the benefit and the architecture of the Active Server Page, it has been considered for the development of the project.

3.4.2.2 HTML

As OIBLS is a web-based system, HTML needs to be used because it is the language used to specify the construction of Web pages.

3.4.2.3 JavaScript

Advantages of using JavaScript

JavaScript's greatest potential gift to a Web site is that scripts can make the page more immediately interactive, that is, interactive without having to submit every little thing to the server for a server program to re-render the page and send it back to the client. For example, consider a top-level navigation panel that has, say, six primary image map links into subsections of the Web site. With only a little bit of scripting, each map area can be instructed to pop up a more detailed list of links to the contents within a subsection whenever the user rolls the cursor atop a map area. With the help of that popup list of links, the user with a scriptable browser can bypass one intermediate menu

page. The user without a scriptable browser (or who has disabled JavaScript) will have to drill down through a more traditional and time-consuming path to the desired content.

On their own, Web pages tend to be lifeless and flat unless animated images are added or more bandwidth-intensive content such as Java applets or other content requiring plug-ins to operate (ShockWave and Flash, for example). Embedding JavaScript into an HTML page can bring the page to life in any number of ways. Perhaps the most visible features built into pages recently with the help of JavaScript are the so-called image rollovers: roll the cursor atop a graphic image and its appearance changes to a highlighted version as a feedback mechanism to let the user know precisely what they're about to click on. But there are less visible yet more powerful enhancements to pages that JavaScript offers.

Interactive forms validation is an extremely useful application of JavaScript. While a user is entering data into form fields, scripts can examine the validity of the data--did the user type any letters into a phone number field?, for instance. Without scripting, the user has to submit the form and let a server program (CGI) check the field entry and then report back to the user. This is usually done in a batch mode (the entire form at once), and the extra transactions take a lot of time and server processing power. Interactive validation scripts can check each form field immediately after the user has entered the data, while the information is fresh in the mind.

JavaScript allows a Web page to perform "if-then" kinds of decisions based on browser version, operating system, user input, and, in more recent browsers, details about the screen size in which the browser is running. While a server CGI program can make some of those same kinds of decisions, not everyone has access to or the expertise to create CGI programs. For example, an experienced CGI programmer can examine

information about the browser whenever a request for a page is made; thus a server so equipped might serve up one page for Navigator users and a different page for Internet Explorer users. Beyond browser and operating system version, a CGI program can't know more about the environment. But a JavaScript-enhanced page can instruct the browser to render only certain content based on the browser, operating system, and even the screen size.

Scripting can even go further if the page author desires. For example, the author may include a preference screen that lets the user determine the desired background and text color combination. A script can save this information on the client in a well-regulated local file called a cookie. The next time the user comes to the site, scripts in its pages look to the cookie info and render the page in the color combination selected previously. The server is none the wiser, nor does it have to store any visitor-specific information.

In OIBLS, JavaScript is used to generate all the quizzes and games questions. The questions are generated randomly and scores are stored temporarily. JavaScript is also used to generate the talking wizard.

3.4.3 Graphics

3.4.3.1 Adobe Photoshop

Advantages of Adobe Photoshop

Before going farther, however, there is a crucial distinction to be clarified between Photoshop and most other digital graphic applications. To allow for Photoshop's versatility and power in emulating the virtual photographic editing process, it was

necessary to design the software to handle images in a ***rasterized*** format, as opposed to the object-oriented, or ***vector*** format used by such applications as Adobe Illustrator, Canvas, MacDraw, or any CAD program. These applications handle curves, lines, color- indeed, all image information-in terms of mathematical functions, where the defining mathematical principle of any graphic element is preserved despite any manipulation performed by the user.

An excellent applied example of this is text, where any amount of rotating, resizing, discoloring, deforming, or general manipulation causes a re-computation of the graphic definition of the text, resulting in a smooth and mathematically perfect final product. An *object* has been manipulated as a package, where the terms which define the contents of that package remain unchanged and directly effect the manner in which the object's manipulation is mathematically calculated.

Rasterized image data, on the other hand, is nothing but a two-dimensional, single-layered bitmap, where, say, curves are considered an arbitrary assembly of dots as opposed to a graphic object defined by a formula depicting the relationship of those dots to one another. In the case of the text example, manipulation will most likely yield imperfect results, as there exists no rule by which text perfection is preserved. Bending, rotating, even resizing text is considered by Photoshop as a manipulation of an assembly of pixels.

In conclusion, there is no such thing as an `object' in Photoshop, other than a temporary selection; once a selection is deselected, it takes the place of those pixels it covers and merges with the flatness of the composite image. This is important to realize,

as Photoshop lacks the versatility afforded to object-oriented programs to rearrange graphic elements at any time.

3.4.4 Database

Database technology is used in a variety of applications. Some serve only a single user a sigh computer while others are for multi user. By using reliable database management system, the consistency and accuracy of data can be ensured.

3.4.4 Database

3.4.4.1 Microsoft Access 2000

Advantages of using Access

Microsoft Access is very easy to use. It is a unique product in that it provides tools which can be mastered by even the most inexperienced database users. Filtering, sorting, querying, and form and report creation are fairly simple tasks, especially when using the many toolbars, wizards, and graphical interfaces provided with Microsoft Access. This flexibility allows the experienced developer to build framework database applications, which can be later modified and added to by the client. Instead of putting 100 percent of the database application's development and upgrades into the hands of the developer, the end-user has the flexibility to add to the application with his/her own hands.

When comparing various database design systems, Microsoft Access is by far the easiest way to share and move data. It's single file system makes it a breeze to upload, download, or copy and paste entire databases to other computers.

The Microsoft Access one file system provides a simple way to make backups. Instead of backing up several to hundreds of data files, only one single file needs to be backed up. Depending on the size of the database and location of the backup medium, this can be as easy as copying and pasting the file to another drive.

There is no easier product for making an archive of a database. Simply copy the file that contains the data, paste it to a safe place, and rename the file as an archive. The original file can still be used as it is or open an empty copy of your database to start a new day, week, month, quarter, etc. Later on, archives can be combined through queries, to analyze and report summaries for a particular group of data or period of time.

3.4.5 Web Server

3.4.5.1 Microsoft Personal Web Server

The main strength of Personal Web Server (PWS) is that it provides a convenient and inexpensive development environment for Windows 9x machines, without the need for powerful hardware. A copy of your Web site can be copied to a local machine and revised on a workstation locally. This workflow protects the real "live" site from damage during development. Saving and viewing sites on a local drive has the advantage of allowing the developer to review progress without transferring files repeatedly. Once the development process has been completed, all the code must be transferred by FTP or HTTP to the remote server. However, this one-time transfer is less expensive in terms of time and resources than repeated transfers.

One of the main drawbacks of PWS is that it can be awkward to install and get up and running correctly.

3.5 The Requirements Process

Before developing a system, it is very important to capture all the necessary requirements. A requirement is a feature of the system or a description of something the system or a description of something the system is capable of doing in order to fulfill the system's purpose *(Pfleeger, 1998)*. As for this project, the requirements were gathered through research on the Internet and books, analyzing on the results from the survey conducted, and review of the existing systems.

3.5.1 Requirements Elicitation

Requirements elicitation is an especially critical part of the process. A variety of techniques must be used to determine the user's needs and what they really want in the system. Requirements can be separated into three categories:

- requirements that absolutely must be met
- requirements that are highly desirable but not necessary
- requirements that are possible but could be eliminated

The figure below shows the process of determining requirements.

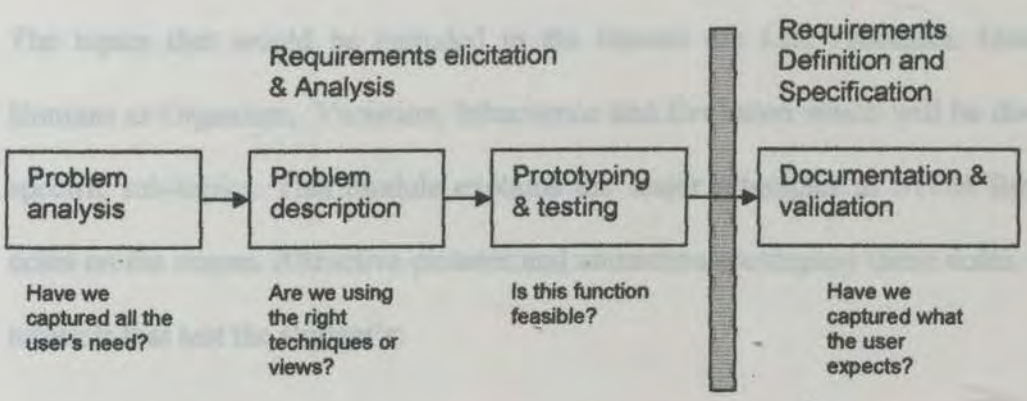


Figure 3.2: The process of determining requirements

3.5.2 Requirements for Online Interactive Biology Learning System (OIBLS)

Through the information gathered, the outline for OIBLS is prepared. Basically, requirements are divided into two namely functional requirements and nonfunctional requirements.

3.5.2.1 Functional Requirements

A functional requirement describes an interaction between the system and its environment. It also describes how the system should behave given certain stimuli. OIBLS is divided to eight modules: Topics, Experiments, Tutorials, Search Engine, Links, Chat Room, Game, and Mail. OIBLS provides an interesting learning environment for the students. Text, graphics, animations and presentation in the lessons section are well matched for both students and teachers.

Lessons Module

The topics that would be included in the lessons are Life Processes, Green Plants, Humans as Organism, Variation, Inheritance and Evolution which will be divided to its specific sub-topics. This module explains the major principles in STPM Biology with notes on the screen. Attractive pictures and animation accompany these notes. There are tutorials that test the student's:

i) Volume 1 - Life Processes & Green Plants

- Cells & Chromosoms
- Osmosis

ii) Volume 2 – Humans as Organism

- Circulation
- Movement & Growth

iii) Volume 3 - Variation, Inheritance & Evolution

- Meiosis
- Mitosis

Any of the above sub-topics can be selected and there would be a brief lesson. After listening to the lesson, there would be a quiz to test the student's understanding.

Experiment Module

This module contains few experiments cover in STPM Biology syllabus to give better understanding on the topics related but users only can control a few experiments.

Tutorial Module

This module lets users select questions from the topic they wish to work on. OIBLS will not give any feedback to user until the user clicks on the summit button. Once the user start answering questions, a time will run to show the time taken. User can go back forth and back to answer the question and change answers and change answers before summit the answers.

Search Engine Module

This module allows the user to search the tutoring notes in the database. Besides, this module also include variety of search criteria and ability to search the content of the documents. The documents in the database can be search by typing keyword, term, phrase into the search field then the search button is to be pressed to initiate the search process.

Links Module

This module contains links that will bring users to related web pages for further understanding. Content of the links are related to the STPM Biology syllabus.

Chat-room Module

With this chat room, the system able to enhance communication among students, teachers and parents. With this chat room, they can chat and discuss among each other in real time.

Game Module

This module contains a few interesting game which will increase the interest of student in learning Biology and also to test their skills as well as their understanding.

Mail

The purpose of this module is to promote this web site to as many people as possible. Users of this site can send the URL of the current page that they are viewing to their friends. When they select forward, a new Microsoft Outlook mail will be created. All that they need to do is type the e-mail address of the receiver and click Send.

3.5.2.2 Nonfunctional Requirements

A nonfunctional requirement or constraint describes a restriction on the system that limits our choices for constructing a solution to the problem. These constraints usually narrow our selection of platform, or implementation techniques or tools; however, the selection is made at the design stage, after the requirements have been specified. Below are the nonfunctional requirements that is needed for OIBLS:

a) User - friendly

Users are able to browse the website without any problem. It is important to make sure that users are comfortable and do not encounter difficulties while using the system. The system is easy to use, with its graphical user interface user can point-and click their way around easily. The talking wizard also acts as a guide that gives brief explanations in every page.

b) Attractive Interface

As OIBLS is designed for upper secondary school students, the interface of the system would be very informative and attractive in order to attract and maintain student's interest and attention. Graphics that would be used will be based on biology characters and a reasonable amount of animation would be implemented.

c) Easy to Navigate

As mentioned earlier, this system is designed for secondary school students. So, the navigation for this system is made as simple as possible. The navigation buttons and icons are either graphics or symbols which is easy to understand.

d) Interactive

This Web system, with its pages, enables interactivity between users and the system. The most common form of interactivity is clicking on hyperlinks to navigate around the system. Some pages have input boxes into which the user can enter textual information. As for the input boxes where the user enters the answer to the questions, immediate feedback will be given.

e) Learnability

Learnability refers to the ease with which new or occasional users may accomplish certain tasks in using the OIBLS. Users are quickly able to understand the most basic comments and navigation options and use them to locate wanted information. In addition to easily understanding functionality of OIBLS, OIBLS will be easy to remember. The casual users should have no problems in remembering how to use and navigate in the system after periods of non-use.

f) User Satisfaction

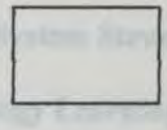
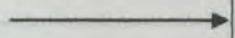
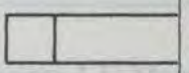
OIBLS is designed to be enjoyable to use and pleasing to users. User satisfaction will be within acceptable levels of user cost in terms of tiredness, discomfort, and individual effort so that the satisfaction causes continued and enhance the usage of the OIBLS.

Chapter 4 - System Design

Design is the creative process of transforming the problem into a solution; the description of a solution is also called design *(Pfleeger, 1998)*.

A system model is a representation of an in-place or proposed system that describes the data flow throughout the structure. The model describes the points where data or information enters a system and the places where it will be processed, as well as the actions taken and the points where the data will be an output. Design diagrams include data flow diagrams (DFD), structured charts, decision trees, and other items.

For OIBLS, DFD and structured charts will be used to model the system. Structured charts will be used to show the outline of the system. DFD will give the graphical illustration that shows the flow of data and logic within the system. DFD comprises of four basic symbols:

Symbols	Name	Description
	Entity	An external entity that can send data to or receive data from the system. Interacts with the system but considered as outside of the boundaries of the system.
	Flow of Data	Used to show the movement of data from an origin to a destination with the head of arrow pointing towards the destination.
	Process	It represents the transformation or processing of information within a system.
	Data Store	Shows a depository for data that allows addition or retrieval of data.

4.1 Designing OIBLS

The design of OIBLS is based on all the information gathered which has been explained in Literature Review. The content of the system is designed based on the requirements of the end users. The advantages and disadvantages of the existing systems are taken into consideration when designing OIBLS. Basically, these are the characteristics of OIBLS:

- user friendly
- simple and easy to understand instructions
- lessons focused on topics (Life Processes, Green Plants, Humans as Organism, Variation, Inheritance and Evolution)
- game based on biology theories.
- attractive interface
- well organized

The language chosen to develop OIBLS is English based on the result of the survey conducted. Moreover the STPM Biology examination is conducted in English.

4.2 System Structural Design and Data Flow Diagram (DFD) for Online Interactive Biology Learning System (OIBLS)

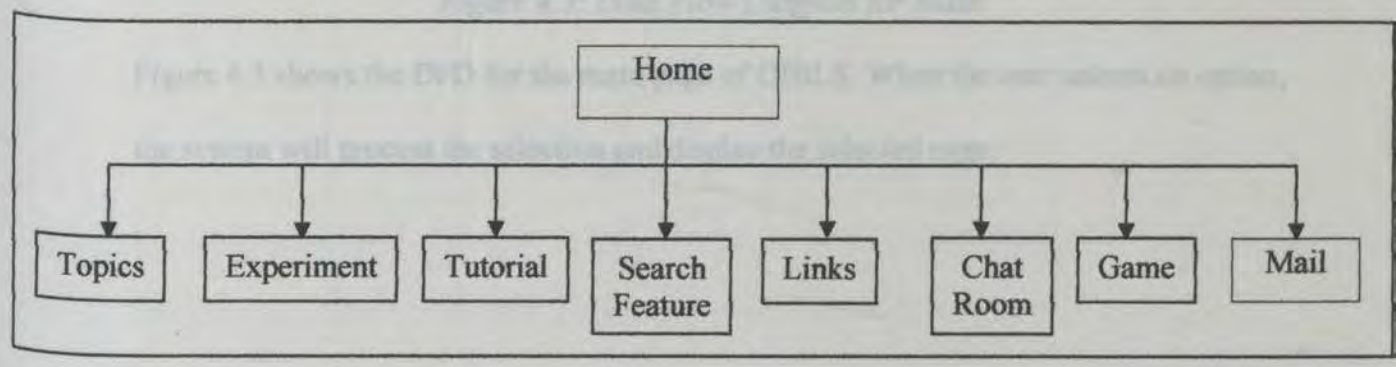


Figure 4.1: Main Structural Design for Online Interactive Biology Learning System

As shown in the figure 4.1, OIBLS is divided into 8 main modules. These modules are the links that the user will see in the OIBLS homepage. User can click at any link and the site will move on the selected page. Some of the modules have sub-modules whereas some of them are HTML text pages only.

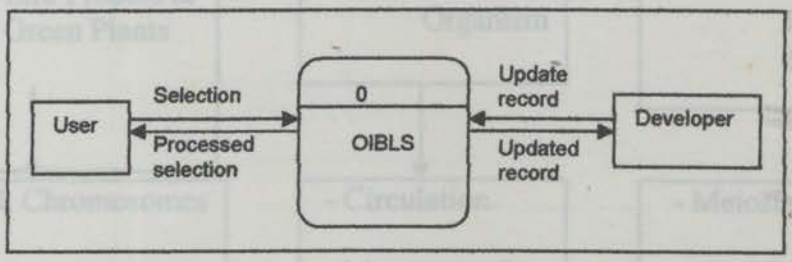


Figure 4.2: Context diagram for OIBLS

Figure 4.2 shows the context diagram for OIBLS. The main entities are the users and the developer of this site. OIBLS processes the user's selections and the updates done by the developers in the database.

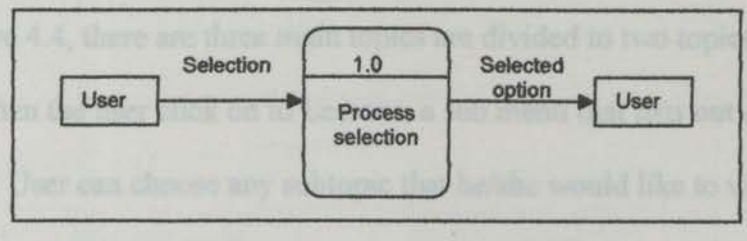


Figure 4.3: Data Flow Diagram for Main

Figure 4.3 shows the DFD for the main page of OIBLS. When the user selects an option, the system will process the selection and display the selected page.

4.2.1 Lessons

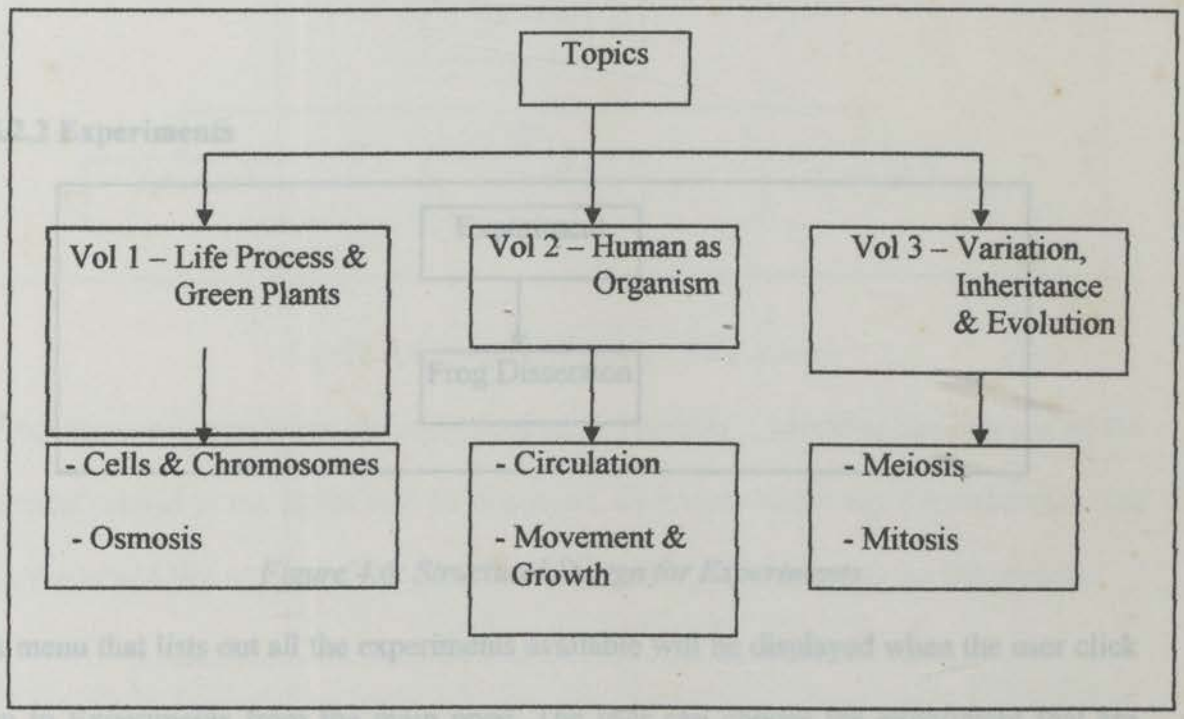


Figure 4.4: Structural Design for Lessons

As shown in figure 4.4, there are three main topics are divided to two topics each. From the main page, when the user click on to Lessons, a sub menu that lists out all the topics will be displayed. User can choose any subtopic that he/she would like to view. The Data Flow Diagram (DFD) below shows the process.

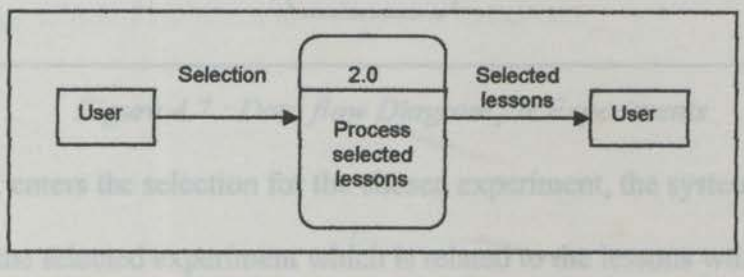


Figure 4.5: Data Flow Diagram for Lessons

Figure 4.5 shows the DFD of Lessons. When the user selects a topic, the system will process the selected lesson and display it to the user.

4.2.2 Experiments

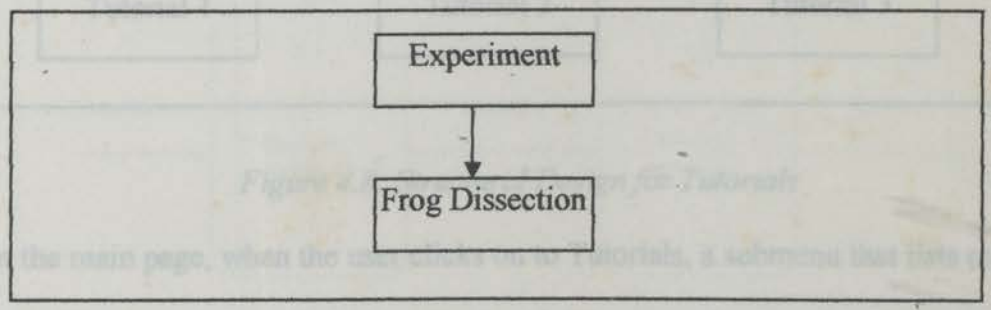


Figure 4.6: Structural Design for Experiments

A menu that lists out all the experiments available will be displayed when the user click on to Experiments from the main page. The user can choose the experiment that are related to the lessons. The Data Flow Diagram (DFD) below shows the process.

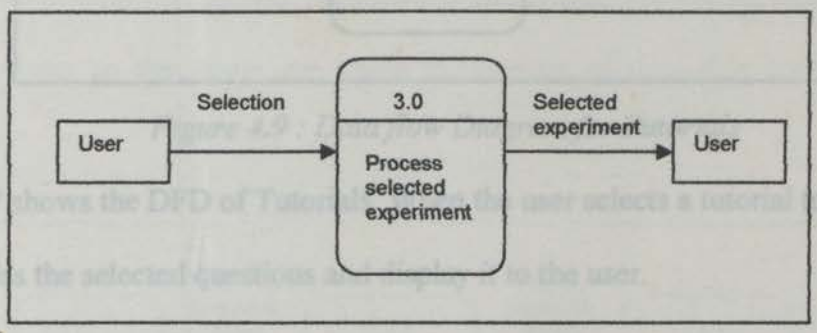


Figure 4.7 : Data flow Diagram for Experiments

When the user enters the selection for the chosen experiment, the system will process the selection and the selected experiment which is related to the lessons will be displayed.

4.2.3 Tutorials

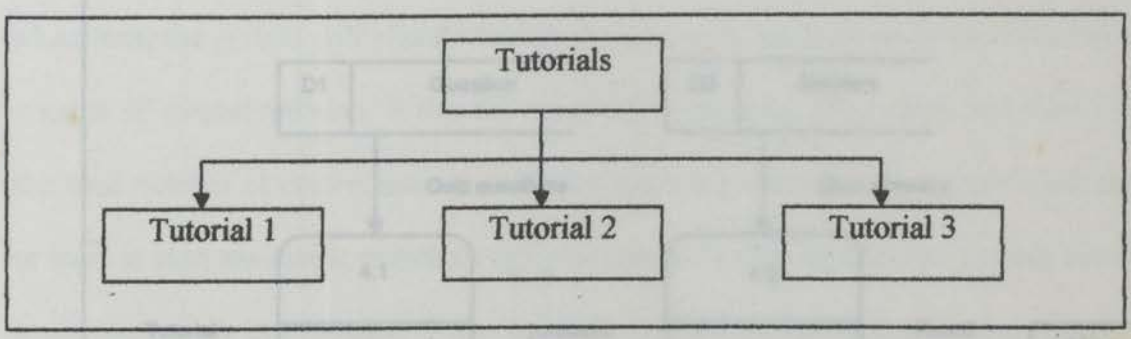


Figure 4.8: Structural Design for Tutorials

From the main page, when the user clicks on to Tutorials, a submenu that lists out all the tutorial related to the topics will be displayed. User can choose any tutorial topics that he/she would like to try on. The Data Flow Diagram (DFD) below shows the process.

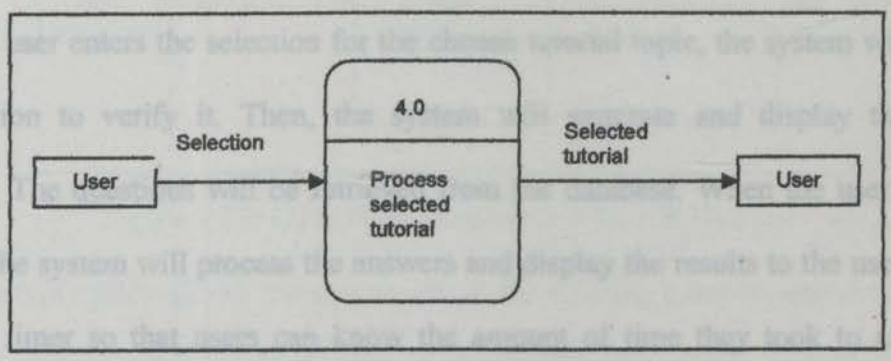


Figure 4.9 : Data flow Diagram for Tutorials

Figure 4.7 shows the DFD of Tutorials. When the user selects a tutorial topic, the system will process the selected questions and display it to the user.

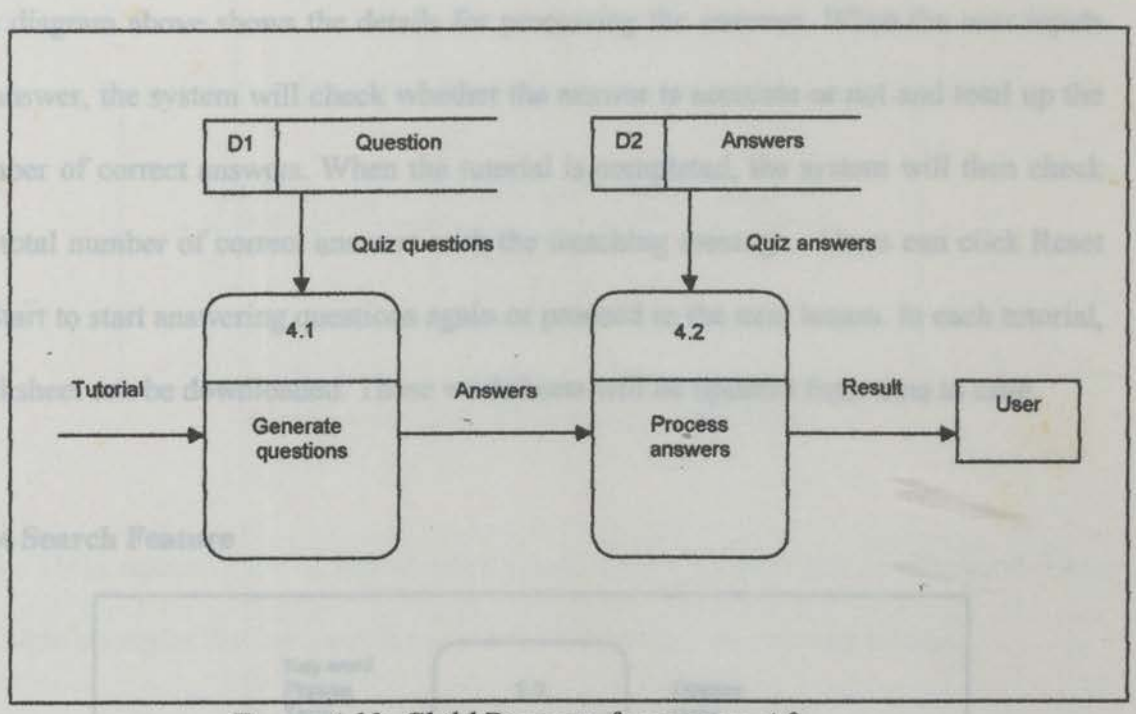


Figure 4.10: Child Diagram for process 4.0

When the user enters the selection for the chosen tutorial topic, the system will process the selection to verify it. Then, the system will generate and display the tutorial questions. The questions will be retrieved from the database. When the user input the answers, the system will process the answers and display the results to the users. There will be a timer so that users can know the amount of time they took to answer the questions.

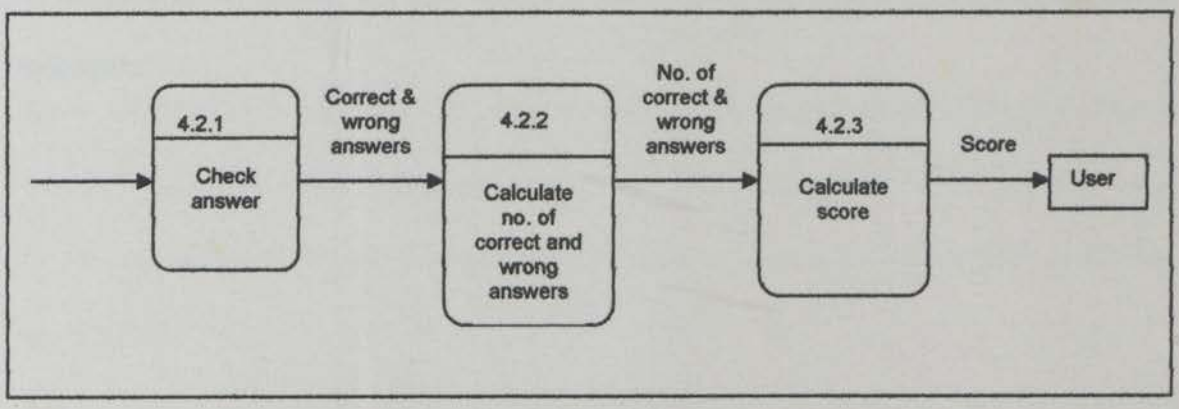


Figure 4.11 Child diagram for process 4.2

The diagram above shows the details for processing the answers. When the user inputs an answer, the system will check whether the answer is accurate or not and total up the number of correct answers. When the tutorial is completed, the system will then check the total number of correct answers with the matching message. Users can click Reset or Start to start answering questions again or proceed to the next lesson. In each tutorial, worksheet can be downloaded. These worksheets will be updated from time to time.

4.2.4 Search Feature

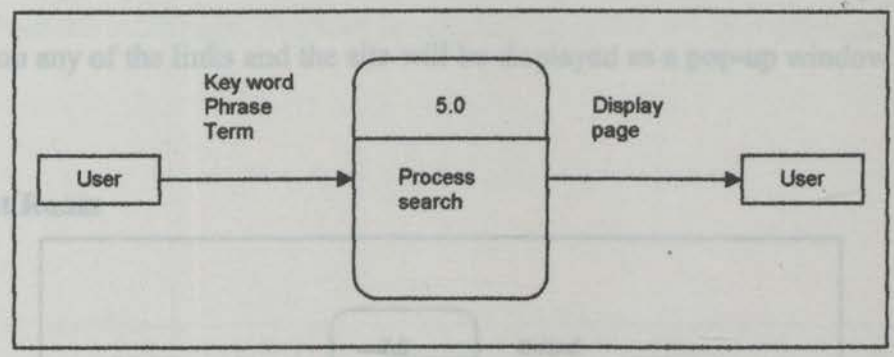


Figure 4.12: Data Flow Diagram for Search Feature

Search Feature option allows the user to search the tutoring notes directly from the site. When the user types the keyword, term or phrase in to the search field, and clicks the search button, the system will generate and display the page.

4.2.5 Links

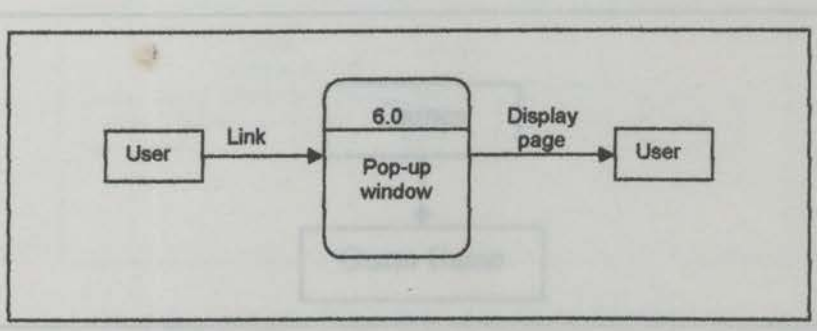


Figure 4.13: Data Flow Diagram for Links

In the Links option, a list of link to other educational web-sites will be displayed. User can click on any of the links and the site will be displayed as a pop-up window

4.2.6 Chat Room

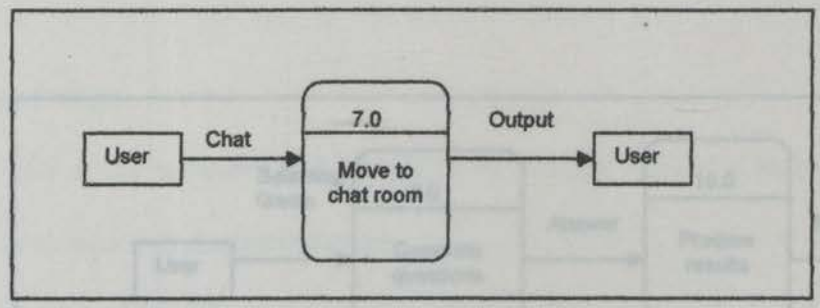


Figure 4.14: Data Flow Diagram for Chat Room

In the chat room option, the user is able communicate and exchange views with other web users.

4.2.7 Games

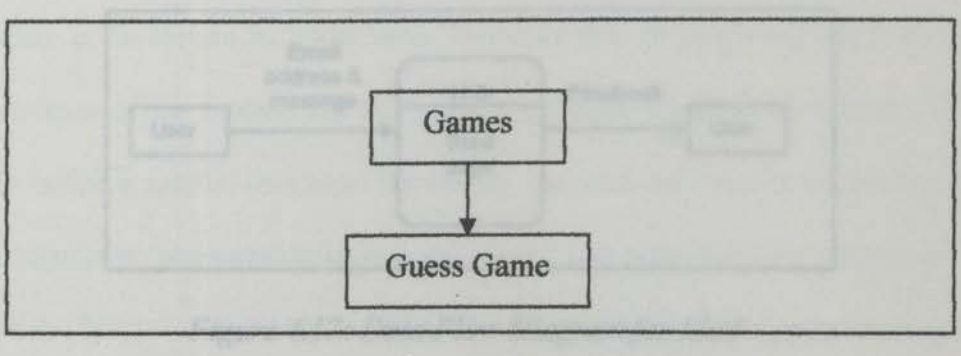


Figure 4.15: Structural Design for Games

Similar to Lessons, a the Game page available will be displayed when the user click on to Gams from the main page. The user can choose the game and start playing.

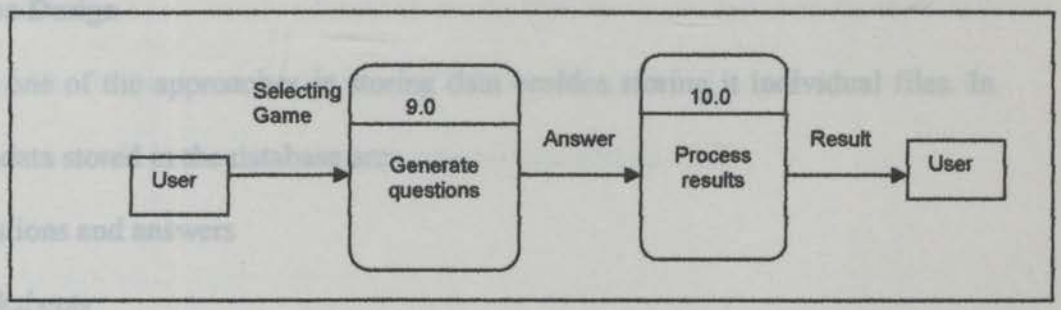


Figure 4.16: Data Flow Diagram for Games

When the user select a game, an information page about the game will be displayed. Here, users will be given the information on how to play the game. Then the game will be processed and displayed. The system will process the results and display it for the users to view.

4.2.8 Mail

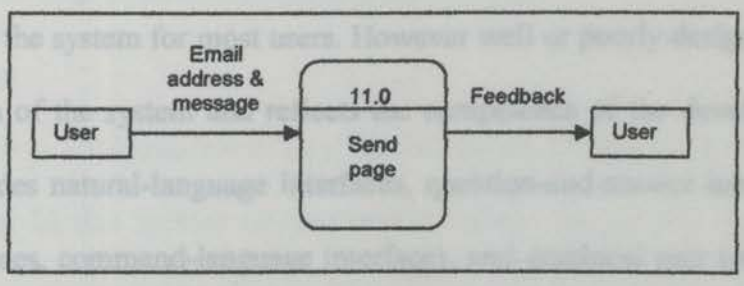


Figure 4.17: Data Flow Diagram for Mail

This option allows a user to send the URL of the page they are currently viewing to their friends. When the user clicks on Mail, a new Microsoft outlook message will appear on the screen. The user needs to input the email address of the recipient and a short message which is optional. After completing the necessary information, the URL of the current page that the user is viewing will be sent to the stated email address.

4.3 Database Design

Database is one of the approaches in storing data besides storing it individual files. In OIBLS, the data stored in the database are:

a) Questions and answers

b) Worksheets

c) Student info

The data stored for OIBLS is not complicated as those for an information system. Microsoft Access 2000 is chosen as the database for OIBLS.

4.4 Interface Design

The interface is the system for most users. However well or poorly designed, it stands as a representation of the system and reflects the competence of the developer. Types of interfaces includes natural-language interfaces, question-and-answer interfaces, menus, form-fill interfaces, command-language interfaces, and graphical user interfaces (GUIs) and the Web (WWW - World Wide Web). The user interface has two main components: presentation language, which is the computer-to-human part of the transaction, and action language, which characterizes the human-to-computer portion. Together, both concepts cover the form and content of the term *user interface*.

As OIBLS is a web-based system developed for students, the interface would be designed to be informative and attractive. The interface design will be designed to be user friendly, attractive, and easy to navigate. Graphics and animation that will be included would be at a reasonable amount to ensure that the download time for the site is not too slow. The main attraction of this site is the talking wizard which acts as a tutor guiding the students throughout the lessons ,experiment and tutorials.

Chapter 5 – System Implementation

5.1 Introduction

This system implementation involves the system development environment and program coding. In this system implementation phase, the system requirements and design are converted into program code. This phase always involves some modifications to the previous design due to the limitations of the programming language used.

Each web page of OIBLS was developed separately and later integrated into a fully functional system once each page has been tested successfully.

5.2 Development Environment

5.2.1 Hardware used in developing the system

- Intel Pentium 3 Processor 500 MHz
- Memory 256 MB RAM
- Hard Disk 40GB space
- Other standard desktop PC compliance

5.2.2 Software used in developing the system

- Windows 98 as the operating system
- Internet Explorer 5.5 as web browser to view the web pages design
- Macromedia Dreamweaver Ultradev to generate ASP pages
- Macromedia Dreamweaver 4 to generate the HTML pages
- MASH (Microsoft Agent Scripting Helper) used to generate the talking wizard
- Notepad and Wordpad to edit the coding
- Microsoft Word 2000 to write the documentation

5.3 Implementation

At the beginning stage, OIBLS is planned to be developed using Macromedia Flash. However, due to the ability of JavaScript of generating interactive questions and the talking wizard, the development of OIBLS is changed to JavaScript and Java.

5.4 Web Pages Development

Among the criteria that were applied during the selection of the programming language are:

- Availability of the development tools
- Knowledge of the software development tools
- Nature of the system to be developed

Therefore, languages used to develop the web pages need to be chosen appropriately to ease the development of the web pages. Languages used to develop the web pages are ASP, HTML, JavaScript and Java. HTML is the basic language for home page designing whereas JavaScript and Java are used to perform and user interaction. This includes the interactive tutorial questions, game, chat-room, and the talking wizard.

The designs of the web pages are done by drawing sketches on papers and then created in Adobe Photoshop. Flash is mainly used to create the buttons and animations. Then, the pages are built with Macromedia Dreamweaver. JavaScript that generates the tutorial are then inserted in the HTML documents. Once the JavaScript is inserted, any modification is done using Notepad or WordPad only. This is to ensure that the page is error free.

5.5 The Flow of OIBLS

Shown below is the basic flow of OIBLS that has been implemented:

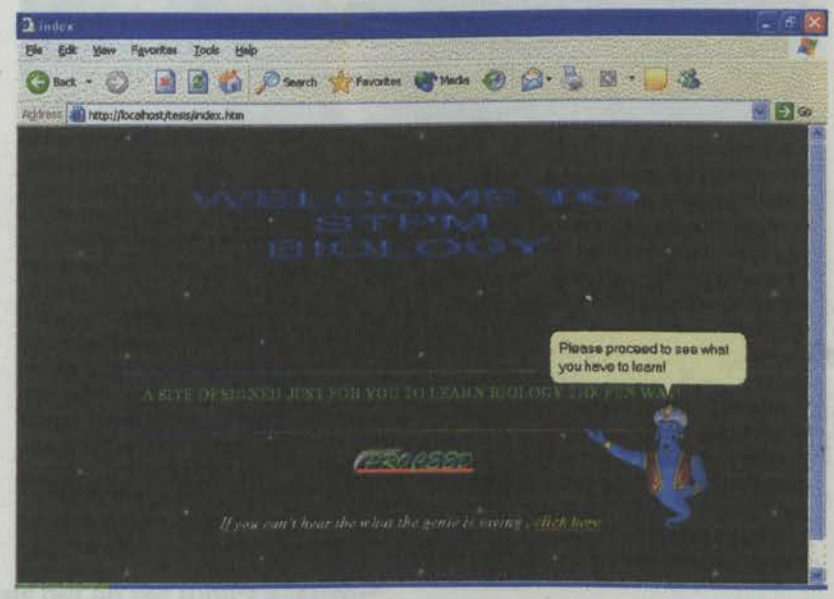


Figure 5.1: OIBLS's Welcome page

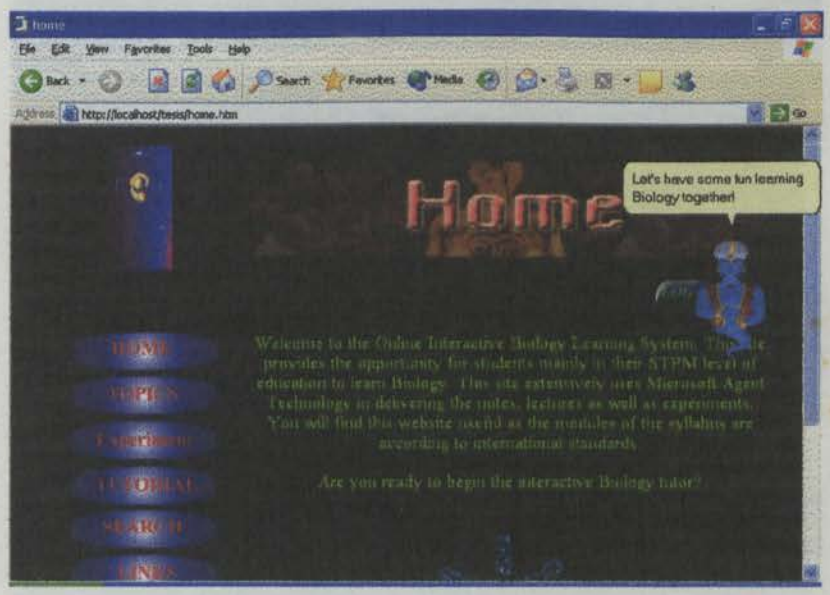


Figure 5.2: Homepage

This page gives a brief explanation about OIBLS and users can proceed to all the other modules from here.

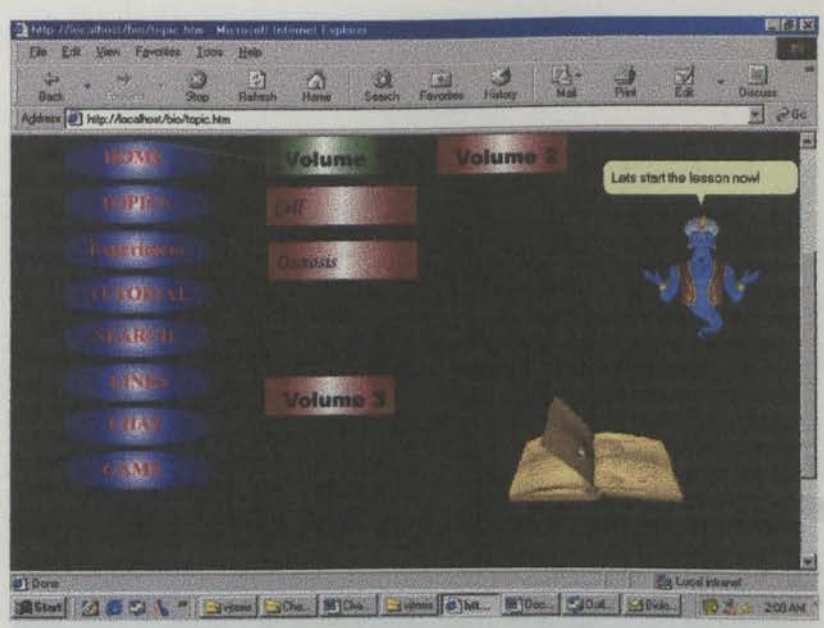


Figure 5.3: Lessons

This page lists out all the topics available.

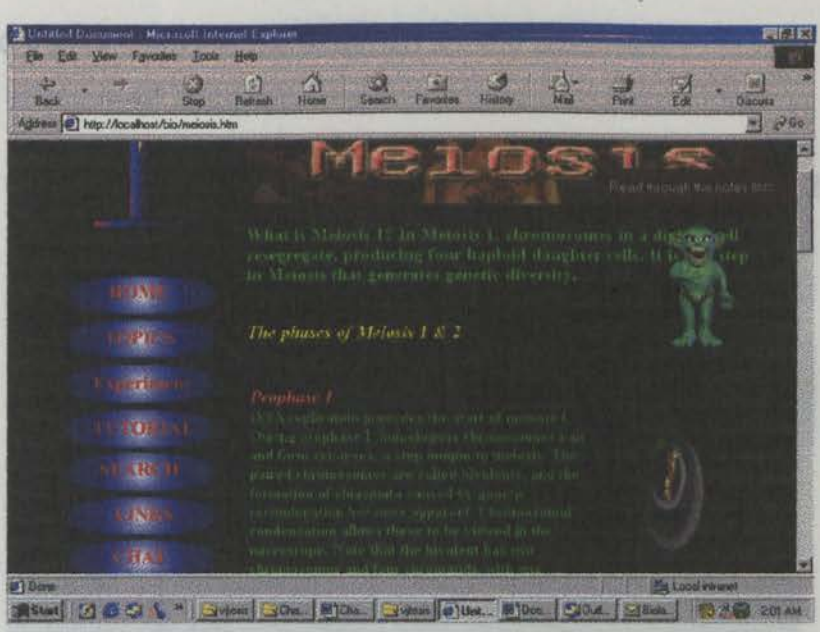


Figure 5.4: Example of a lesson

The figure above shows an example of the lessons.

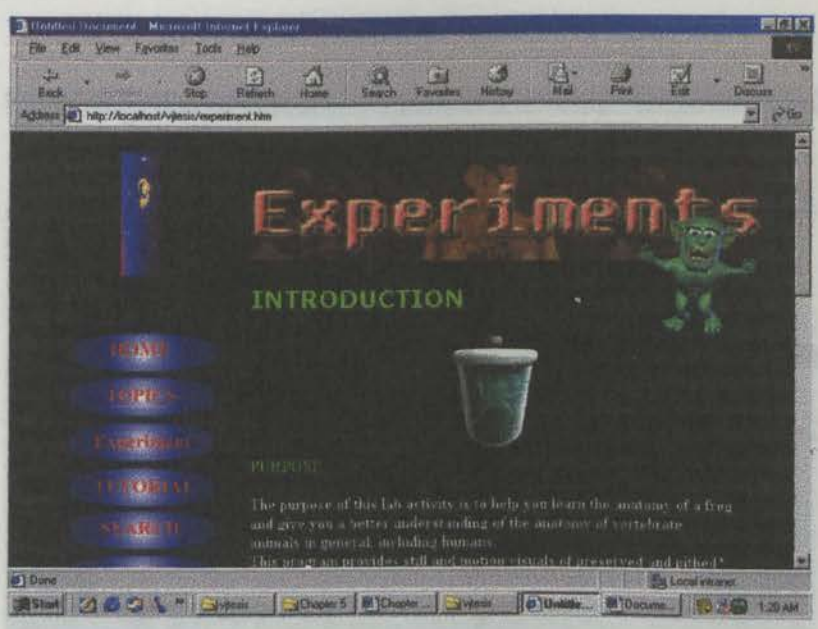


Figure 5.5: Experiment

This page gives a brief explanation of the lab activity conducted.

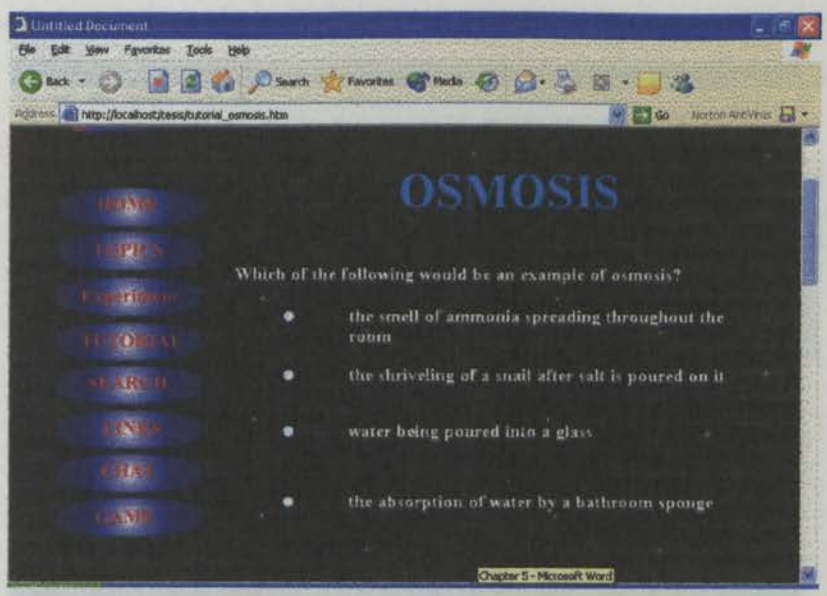


Figure 5.6: Interactive questions

The figure above shows an example of the interactive tutorial questions. Almost every lesson has its own different set of tutorial questions.

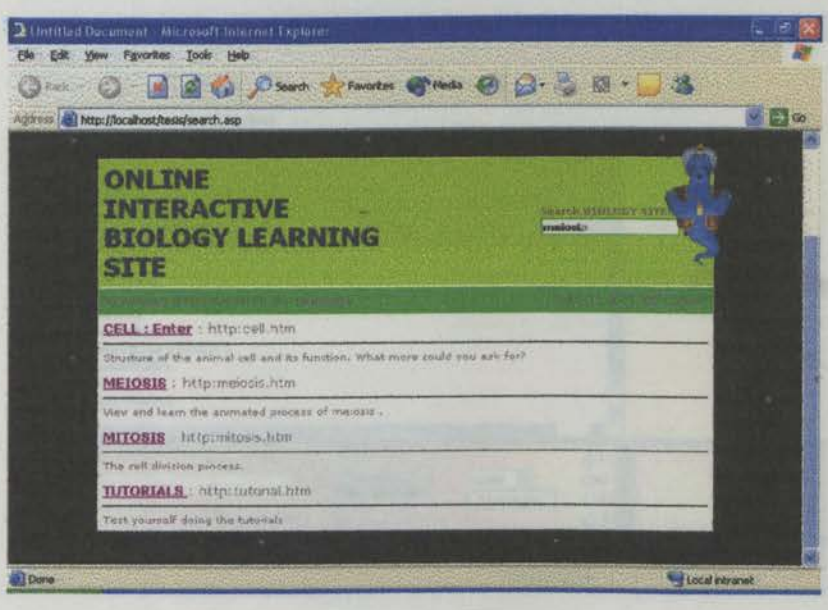


Figure 5.7: Search

This page allows the user to search the site with keywords.

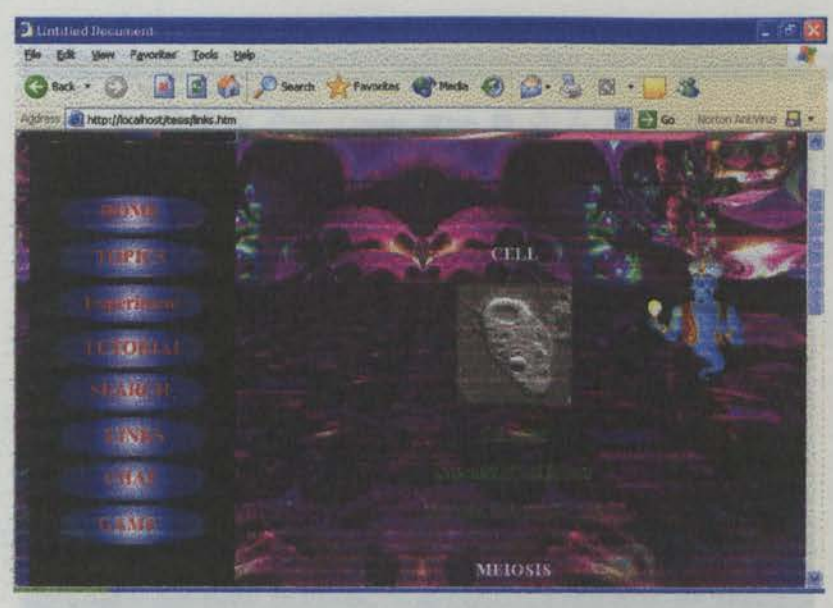


Figure 5.8: Links

This page shows the links to other educational sites. When the user clicks on the link, the site will be opened as a pop-up window.

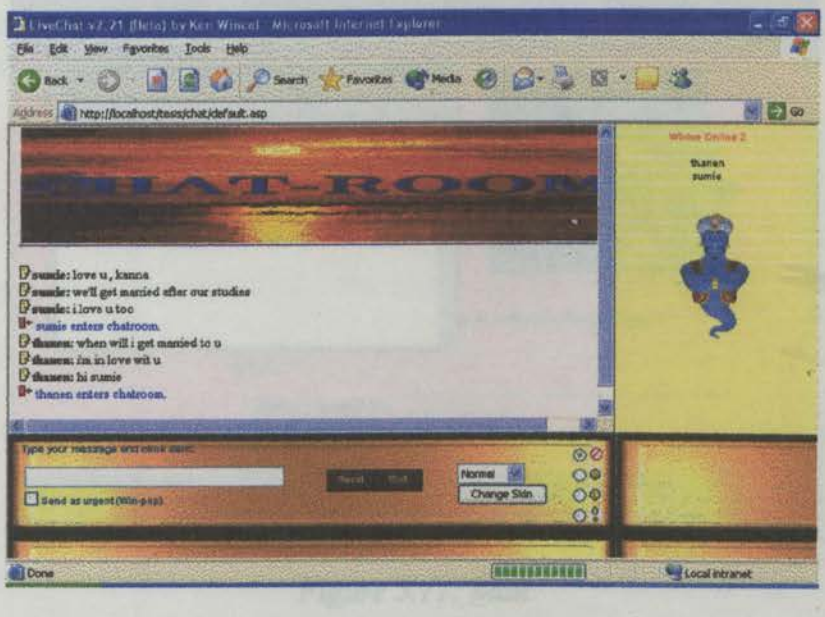


Figure 5.9: Chat – Room

The figure above shows the chat-room.

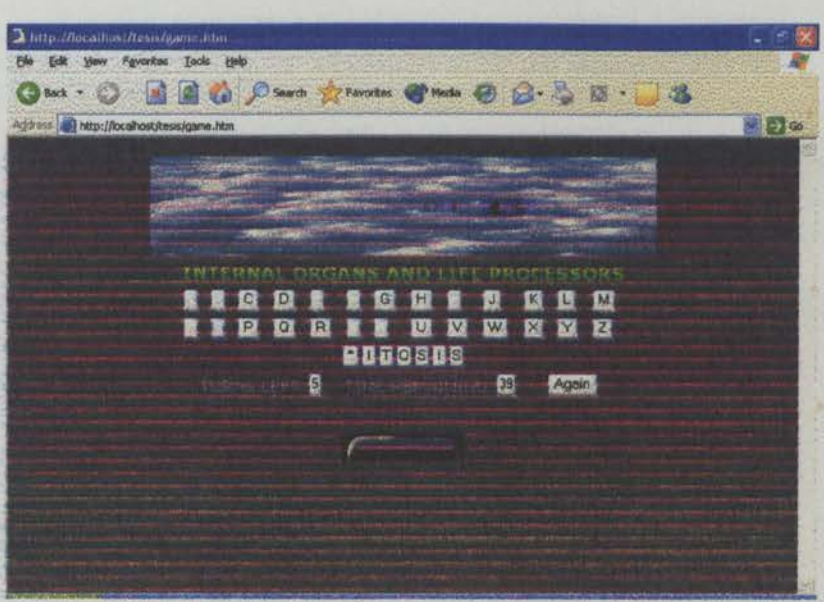


Figure 5.10: Game

The figure above shows the game available, Guess.

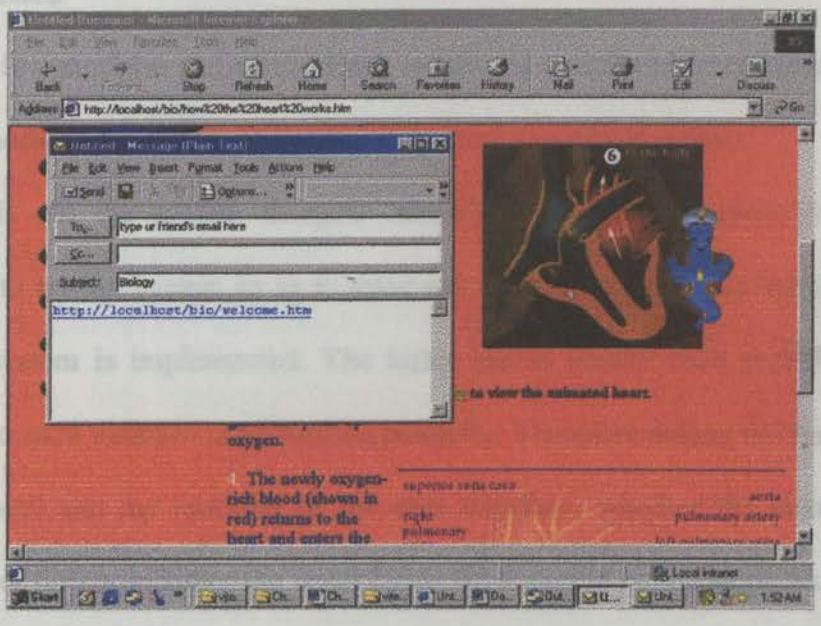


Figure 5.11: Mail

When the user click on 'MAIL' on any page, a new Microsoft Outlook message will appear. The user should just input the recipient's email address and the URL of the current page would be sent.

Chapter 6 – System Testing

6.1 Introduction

There are a few modules in OIBLS. Each module is coded and tested separately. After that, these modules have to be integrated and tested in a whole system.

The tester is not the system designer himself. A number of users are given the opportunity to try the system so as to trace any unforeseen errors or misunderstanding before the system is implemented. The tester has to ensure each module is running smoothly and each function is performed perfectly. Therefore asking the tester to try out the system will test the usability of the user interface, whether the interface is self-explanatory or not, or whether the tester know what should be the steps taken to run the system. If the tester felt uneasy or confused while testing out the system, the user interface should be revised and improved. Advice that is asked from the tester is to improve the usability of the interface. Sometimes the misuse of the wordings or language in the system might mislead the users.

6.2 The Testing Process

Except for small programs, systems should not be tested as a single, monolithic unit. Large systems are built out of sub-systems, which are built out of modules, which are composed of procedures and functions. The testing process should therefore proceed in stages where testing is carried out incrementally in conjunction with system implementation. Following are the steps in testing OIBLS:

6.2.1 Unit Testing

This is a small unit testing where testing are done on individual components of the system to ensure that they operate correctly. Each web page is tested independently, without other system components. The units that were tested individually are usually the interactive tutorial questions, quiz questions, game, and the wizard.

a) Interactive tutorial questions

It is very important that the questions are generated correctly according to the topic of the lessons. The checking of the answers and results are also tested to make sure of its accuracy.

b) Game

The game is tested carefully to ensure that it functions properly. The game is tested over and over again with various answers and possibilities to find out the possible errors and flaw. Functions are included to overcome these weaknesses.

c) Wizard

The wizard appears on most of the web page. So, every paged is viewed to ensure that the wizard can be seen, heard, and animates correctly. To make sure the wizard really works, the web pages are tested on various computers. Usually, the problem that might occur would be the wizard couldn't be seen or heard. This problem could be fixed by installing the necessary applications, which are Microsoft Agent Character file and Text-to-speech engines.

6.2.2 Integration Testing

After every web page is tested individually, the web pages are integrated into a whole system and tested again. This time, testing is emphasized on the links. Each link on a page is tested repeatedly to make sure that it links to the right page.

6.2.3 System Testing

Finally, system testing would be the last stage in testing. The testing process is concerned with finding errors, which result from anticipated interactions between sub-systems and system components. It is also concerned with validating that the system fulfills the functional and non-functional requirements. System testing can be categorized into a few types:

a) **Stress Testing**

This is to determine the program fulfills the requirements defined for it. It is equally important to ensure that the program works, as it should under extreme conditions. In order to perform stress testing, execute the system in a manner that demands resources in abnormal, quantity, frequency, or volume.

b) **Performance Testing**

For real-time and embedded systems, software that provides required function but does not conform to performance requirements is unacceptable. Performance testing is designed to test the run-time performance of software within the context of an integrated system. Performance testing occurs throughout all steps in the testing process.

6.3 Types of Testing

Generally, there are 2 types of testing:

6.3.1 Statistical Testing

Statistical testing is a software testing process in which the objective is to measure the reliability of the software rather than to discover software faults. Tests are designed to reflect the frequency of actual user inputs. After running the tests, an estimate of the operational reliability of the system can be made. Program performance may be judged by measuring the execution of the statistical tests.

6.3.2 Defect Testing

Defect testing is intended to find areas where the program does not conform to its specification. Tests are designed to reveal the presence of defects in the system. There are 2 approaches to defect testing:

a) **Black-box Testing**

Black-box testing, also called behavioral testing, relies on the specification of the system or software. Tests are used to demonstrate each function is fully operational while at the same time searching for errors in each function.

b) **White-box Testing**

White-box testing, sometimes called glass-box testing, uses the control structure and implementation of the procedural design to derive test cases. Tests are conducted to ensure that the internal operations are performed according to its specifications and all internal components have been adequately exercised.

Chapter 7 –System Evaluation

7.1 System Strength

Here are some of the advantages of OIBLS:

a) User Friendly

Because OIBLS is developed for students, the navigation is made as simple and user friendly as possible so that users do not get confused while surfing the site. Simple instructions are given to ensure users are comfortable and at ease while using the system. Apart from that, the talking wizard also acts as guide for the users and does animations that will keep the students entertained and draws their attention.

b) Attractive Graphical User Interface

The layout of OIBLS web pages are animated and attractive. Images and graphics chosen for the site are suitable for students. Links and buttons are named appropriately with simple words so that students will not have problems understanding it. Lessons and the quiz are also conducted with very simple and easy to understand sentences and phrases.

c) Scope of Lessons

The lessons provided in OIBLS follows the topics which are taught in Malaysia's upper secondary schools. So, it's very suitable for secondary school students who wishes to learn biology on their own or have some fun with learning biology. It can also be used by school teachers to conduct lessons in class .

7.2 System Constraints

a) Simple Lessons

The lessons in OIBLS are very simple and not very complete. It gives brief explanations on each topic and not in detail. The explanation given by the wizard is also very simple.

b) Scope of the Lessons available

Due to the time constraint, the developed lessons are based on the main topics.

7.3 Future Enhancement

a) Detailed Lessons and Scope

Explanations in lessons should be made in detail with more examples and exercises to improve the users understanding. Scope of the lessons available should be broaden so that OIBLS can be used by more students of various level.

b) OIBLS in other languages

OIBLS could be developed in other languages such as Bahasa Melayu to provide its benefits to even more students.

c) Creating a Database

Having a database to store the student's progress in answering the interactive questions so that they can keep track and improve themselves.

7.4 Knowledge and Experience Gained

Knowledge gained throughout the development of OIBLS is really valuable. Knowledge was gained on website development as well as programming coding and concepts. Here, theories and knowledge gained during the course of Information Technology like *System Analysis and Design*, *Graphical User Interface*, and *Multimedia System* just to name a few were literally put into practice. Besides that, the knowledge gained from this project is the awareness of the user's needs and the flow of a system. It was found that users need a user-friendly environment, a readable homepage and clear instruction and guidance. The programmer needs to find and organize the information acquired and analyze the behaviour.

There are improvements in skills of finding information, classifying fields, solving problems and independently plan and accomplish the project on schedule without much supervision.

No doubt that experience has been gained and new knowledge has been acquired. More importantly, the process of doing it has been an exposure to me on how to really plan and work on a project. One important thing I realized is that it is really useful and important to have an up-to-date knowledge and information in keeping up with the fast and ever changing technology of information technology. This project has proved very beneficial for me when I step into the working environment in future.

7.5 Problems Encountered and Solutions

Various problems were encountered throughout the development of OIBLS:

a) Web Page Coding

Problem:

Basically the problem encountered in web pages coding involves the ASP, HTML coding, Java scripting, and JavaScript programming especially the study of the ASP coding and JavaScript, which is very crucial to the development of the system. Most of the coding and scripting problem was encountered in the early stage of the project development. This is due to the ambiguity and lack of understanding in the early stage.

Solution:

The solution to overcome is to adopt a divide-and-conquer approach by first concentrating and understanding the basic concepts of the programming. As the development of the project goes on, the understanding gradually builds up and most of the problems encountered in the earlier stage were overcame easily.

b) Developing the Real System

Problem:

Due to the lack of knowledge and exposure in developing a website, some parts of the system proposed earlier couldn't be developed as a real system. When developing the real system, I realized that certain parts of the system need to be modified.

Solution:

As a solution to this problem, modification was done to the parts, which couldn't be done as proposed and replaced with the best alternatives available.

c) Tools to Develop the System

Problem:

The generation of the talking wizard involves either JavaScript or VBScript. The scripting for Flash is Action scripting. Due to inexperience in all these languages, I do not know how to integrate JavaScript or VBScript into Action scripting.

Solution:

I made the decision to develop OIBLS with HTML, Java language, and JavaScript.

Expected Outcome

The Online Interactive Biology Learning System (OIBLS) is expected to be:

- an effective, interesting, and user friendly learning tool
- able to give users a basic understanding in biology theories and cultivate eagerness and interest in learning Biology.
- able to promote the use of web learning as a preferred teaching approach

Conclusion

Building a web-based application package is a very challenging task. Lots of research, time, and effort have been involved in making this project successful and in fulfilling the task requirements. A comprehensive knowledge in building a web-based application and the relational development tools is also necessary and important. Understanding the user's needs and requirements also contributes a lot in the development of this application.

As a conclusion, it can be said that OIBLS has actually reached its objectives as a multimedia teaching and learning package. The system is interactive, attractive, and most importantly easy to use as OIBLS is developed for students. The system is easy to learn and use and users can master it within a short learning time.

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[d] Bryant, S. C., "Teach Yourself HTML 4." IDG Books Worldwide, Inc., 1999.

[e] Powell, T. A., Whitworth, D. "HTML." McGraw-Hill, 1998.

URL

1) http://www.outreach.utk.edu/weblearning/

2) http://www.epsys.com.sg/implementing_cd.htm

3) http://www.macromedia.com/support/dreamweaver/ts/documents/presalesfaq.htm

4) http://tutorials.beginners.co.uk/view/cobrand/searchmiddleware/i/89

5) http://www.bellcraft.com/mash/main.htm

6) http://dmoz.org/Regional/Europe/United_Kingdom/Education/Secondary/

7) www.kesgrave.suffolk.sch.uk/recentrebshop.html

8) http://www.sebiology.com/education/schpupil_resources.htm

9) http://e-juara.com/htm

10) http://dmoz.org/Science/Biology/Education/

11) http://www.chalkface.net/pagecopy/subjectitems/revision01.htm

12) http://www.projectalevel.co.uk/biology/

13) http://www.teaching-resource.co.uk/resources/biology.htm

14) http://www.dulwich.org.uk/gateway/revision.html

15) www.biota.org/grants/

16) http://www.georgetown.edu/crossroads/mltmedia.html

17) http://snow.utoronto.ca/Learn2/design.html

18) http://www.lmu.ac.uk/lss/staffsup/desmeth.htm

19) http://www.med.monash.edu.au/informatics/techme

20) http://scis.nova.edu/~henkeh/story1.htm

21) http://www.adobe.com

22) http://info.med.yale.edu/caim/manual/contents.html

23) http://home.earthlink.net/~castelnet/info/web-basedlearning.html

24) http://www.curriculum.wa.edu.au/pages/framework/framework08a.htm

25) http://developer.netscape.com/viewsource/husted_js/husted_js.html

26) http://www.webword.com/interviews/goodman.html

27) http://www.mcli.dist.maricopa.edu/show/interact/js.html

28) http://www.clarkson.edu/~dubrovvj/400/javascript/jstutorial/jsintro.htm

29) http://www.xs4all.nl/~ganswijk/chipdir/about/js.htm

30) http://www.melbpc.org.au/pcupdate/9807/9807article11.htm

31) http://www.windows2000.au.com/software/page1.html

32) http://www.clearform.com/microsoft_access.htm

33) http://informationr.net/ir/5-1/paper66.html

34) http://www.macromedia.com/support/ultradev/ts/documents/pws_ld_tips.htm

35) http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnasp/html/msdn_aspfaq.asp

Questionnaire

Subject: Popularity of web-based learning system among upper secondary school students.

1) How would you rate your rate your interest in Biology?

   a) Interesting(10) b) Boring (10) c) Average (30)

2) How many hours you spent on Biology books a week?

   a) < 3 hours (37) b) 3 – 5 hours (8) c) >5 hours (5)

3) Name frequent Biology sites you visit

4) What information do you usually search for:

   a) Cells (20)

   b) Plants (15)

   c) Anatomy (10)

   d) Nutrition (2)

   e) Photosynthesis (4)

   f) Movement & Growth (8)

5) What is your opinion using internet as at mean to learn Biology.

   a) Useful (13)

   b) Not productive (37)

6) How would you rate doing interactive quiz on Biology.

   a) Eases memorization (14)

   b) Increase understanding (18)

   c) A waste of time (7)

   d) Interesting (11)

7) Do you think having an open discussion on Biology topic on the Internet is worthwhile.

a) Yes (38)

b) No (12)

User Manual

Table of Contents

List of Figures

Chapter 2

Chapter 3

User Manual

Chapter 1 - Introduction

Online Interactive Biology Learning System is a web-based multimedia teaching and learning package developed specially for upper secondary students. It provides lessons, interactive tutorials, test and game to make biology learning fun and interesting.

1.1 Run-time Requirements

Hardware configuration requirements to run OIBLS.

a) Type and speed of processor - Pentium 366Mhz and above;

b) Amount of memory - 64 MB RAM and above

c) Size of hard disk - 2GB and above with 500Mb of free disk space ;

d) Operating system - Windows 98 and above;

e) Access to online systems (local network);

f) Speed of network connection - 56K and above;

g) Resolution of the screen - 800 by 600 pixels;

h) Number of colours on the screen - 256 and above;

i) Sound handling - 8-bit and above.

Software configuration requirements to run OIBLS.

a) Windows 98 and above

b) Internet Explorer 5.5 and above

1.2 User Manual Overview

Chapter 1 – Introduction

Brief description about OIBLS and the hardware and software configuration requirements.

Chapter 2 – Getting Started

Gives a simple explanation about how to get started with OIBLS.

Chapter 3 – Topics, Experiment, Tutorials, Search , Links, Chat , Game and Mail.

Explains the modules of OIBLS.

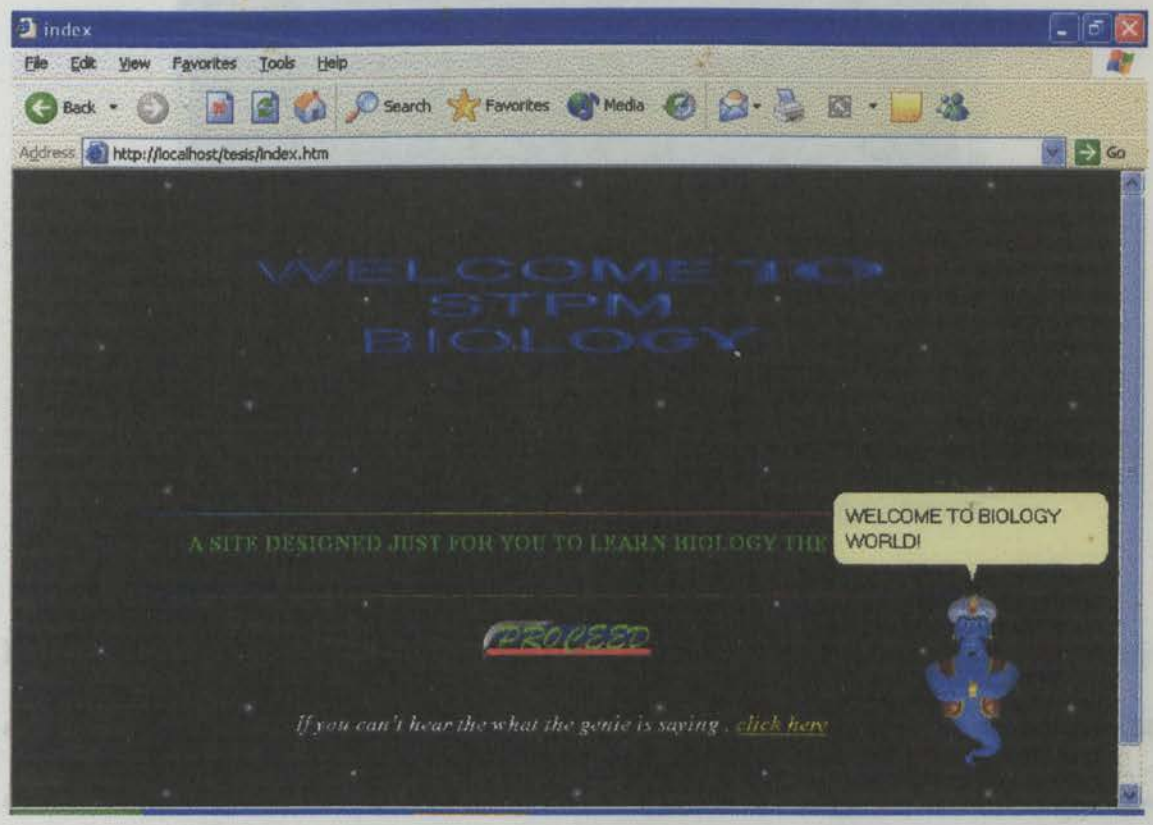

Figure 2.1: Welcome page of OIBLS.

The figure above shows the Welcome page of OIBLS. Users need to type in : http://localhost/tesis/index.htm to view the page. From here, the user can proceed to the login section. If the user is unable to see the wizard or hear the wizard speak, they can click on the necessary link and they will be brought to the next screen.

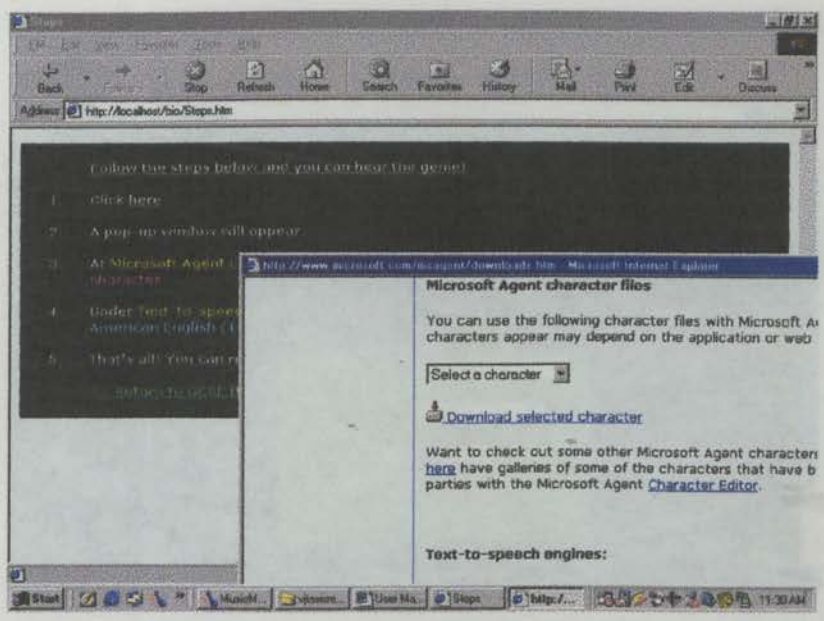

Figure 2.2: Step by step instructions to download the necessary applications

Here, step by step instructions will be given to the user to download the necessary applications so that the wizard can function properly. If a user can see the wizard but couldn't hear it speak, they should download '**Lernout & Hauspie TruVoice Text-To-Speech Engine-American English (1 MB exe)**' under the **Text-to-speech engines** category. If they couldn't see and hear the wizard, they should download both '**GENEI (1.6 MB exe)**' under the **Microsoft Agent character files** and the text-to-speech engine. After installing the necessary applications, they will be able to see and hear the wizard and they can login to OIBLS!

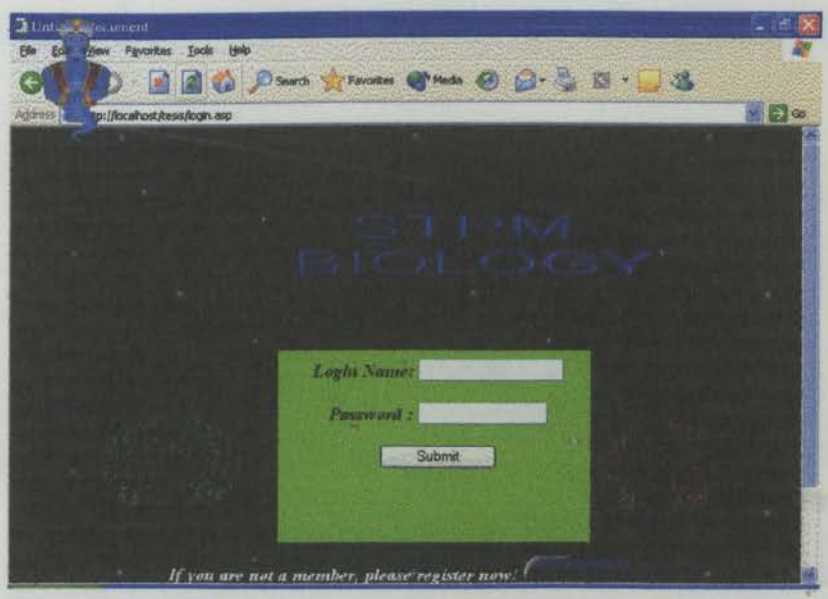

Figure 2.3: Login screen of OIBLS.

A new user has to register by clicking on the register button to have the login account. Registered user has to login and will be lead to the homepage of OIBLS.

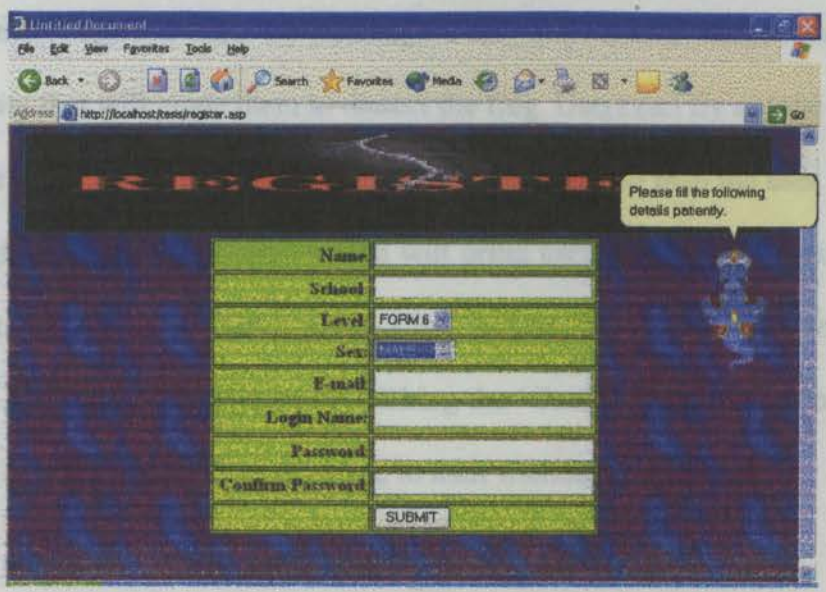

Figure 2.4: Register page of OIBLS.

User has to fill in the following details in the register page and will be lead to the login page again.

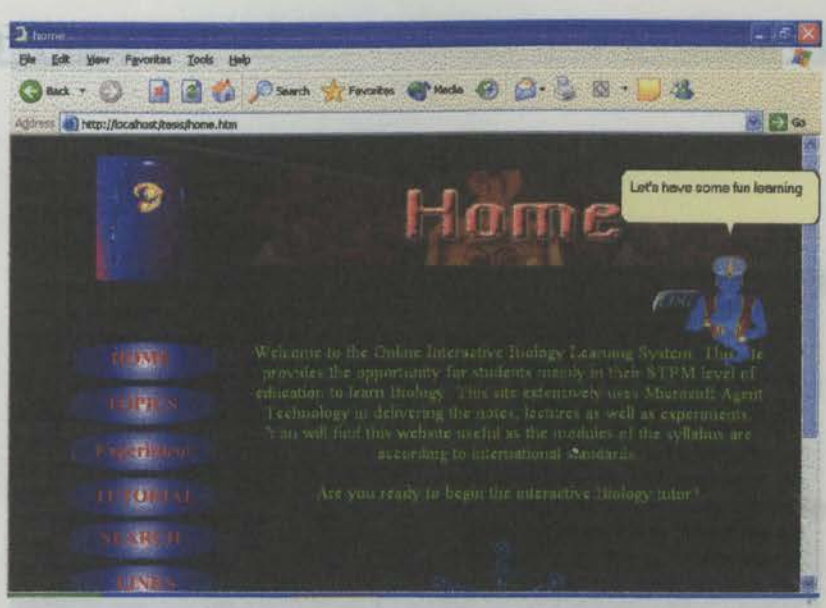

Figure 2.5: Home page of OIBLS

This is the home page of OIBLS. Users can view the topics of the lessons available by clicking on the 'Topics' button. By clicking on the 'Experiment' button, users can view the lab activity that will guide them to dissect the frog. Users can try out the tutorials and test by clicking the 'Tutorial' button. The 'Search' button will help the user to search the notes through the site. The 'Links' button will bring users to a page containing links to other educational sites. By clicking the 'Chat' button, users will be connected to the chat-room. User can play the game by clicking the 'Game' button. Users can also click on 'Mail' to the send the URL of this page to their friends.

Chapter 3 -Topics, Experiment, Tutorials, Search , Links, Chat , Game and Mail.

3.1 Topics

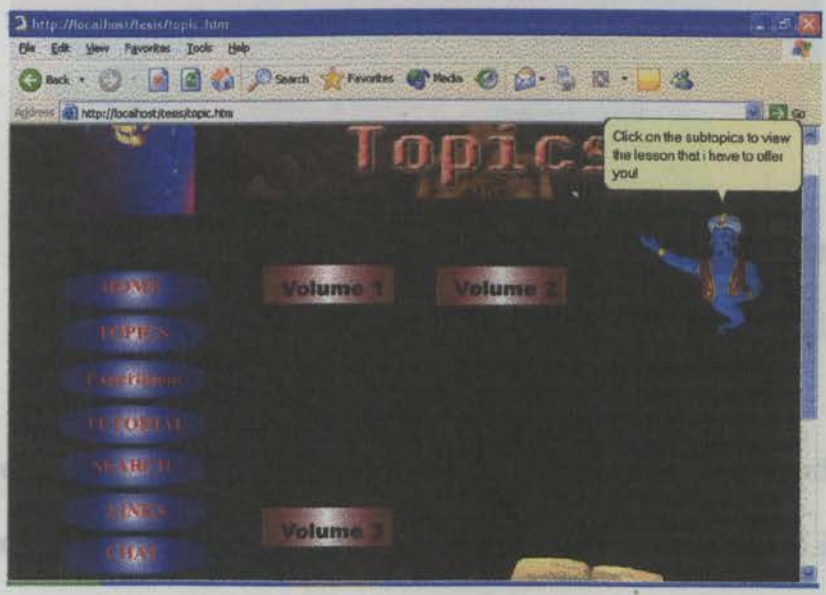

Figure 3.1: Main page for Topics

Figure 3.1 shows the main page for Lessons. Here, the topics that are available is listed. Users can choose to go to any selected topic by simply clicking on the title. They can also learn the lessons from the beginning and proceed to the next one in the lesson itself. There are 3 main topics which are divided to 6 subtopics.

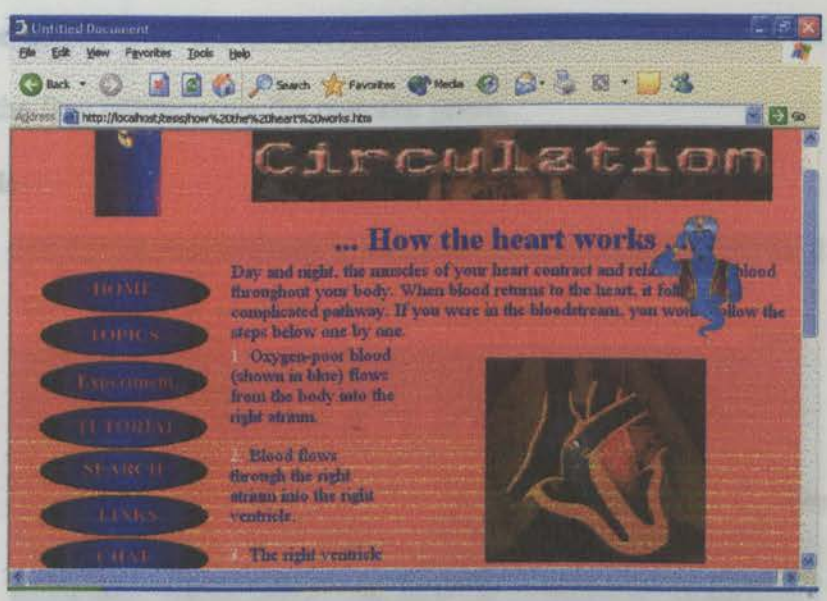

Figure 3.2: An example of lessons

Shown above is the lesson for Circulation. A lesson is started of by a brief explanation by the wizard. Then, the user can learn by looking at the explanations in detail and examples given.

3.2 Experiment

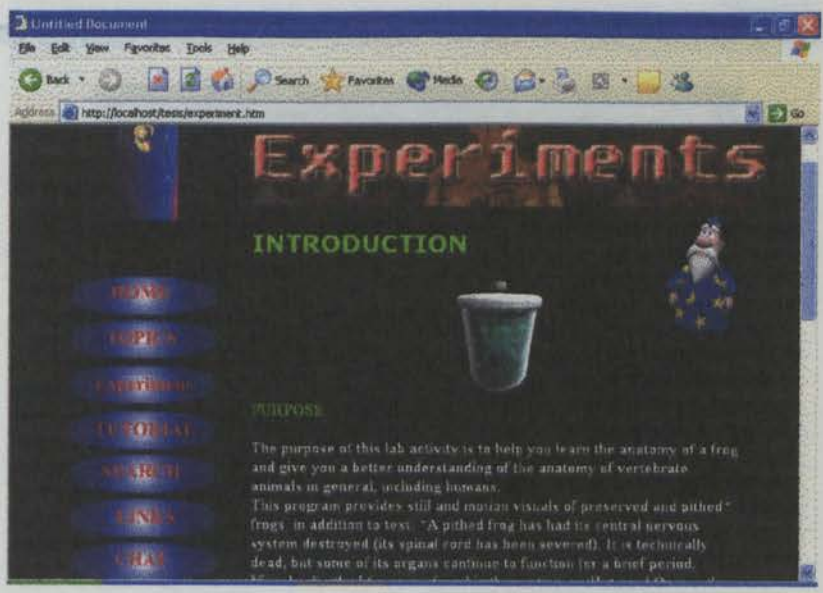

Figure 3.3: Experiment screen

Users will be guided to do the lab activity here. They will be lead the movie where they can dissect the frog online using the material given.

3.3 Tutorials

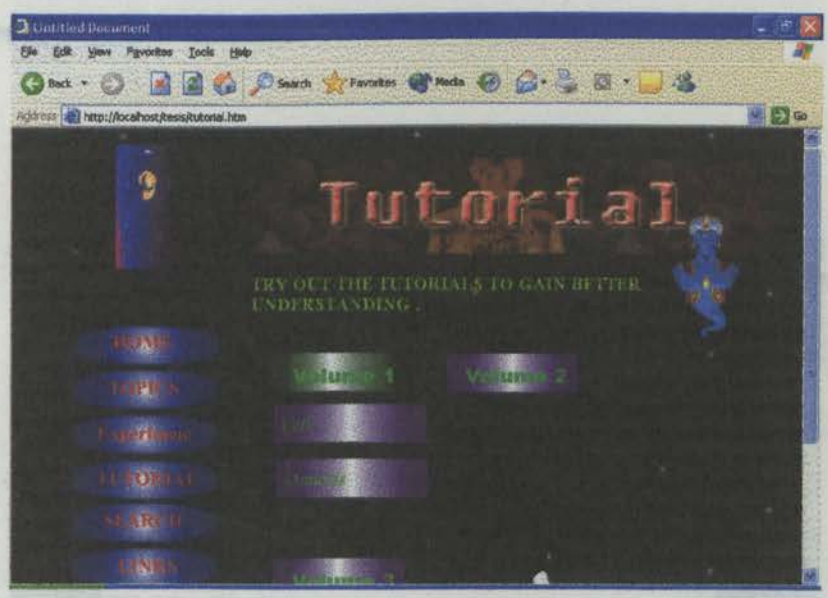

Figure 3.4: Tutorial screen

Users can click on the subtopic of the tutorial they want to do. They can click on the corresponding answers and an alert message will appear with the explanation.

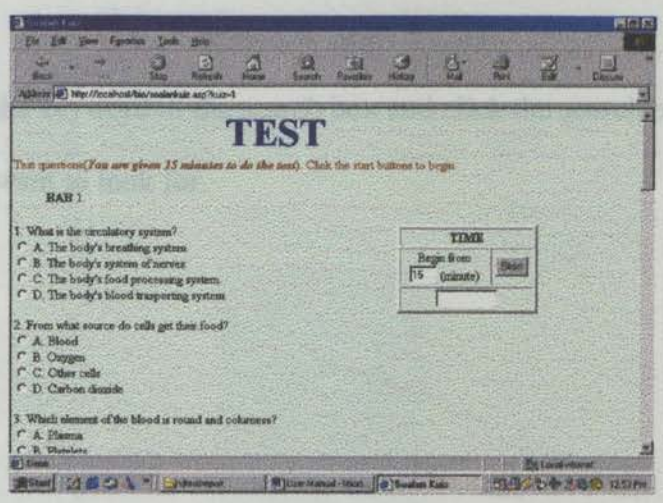

Figure 3.5: Test page

The question on this section is the same with the quiz section. Users can click on the answer button 'A', 'B', 'C' or 'D' to select the answer. Question answered will be indicated by black dot at the "question list' on the left side of the screen. They can click the submit button to view the result.

3.4 Search

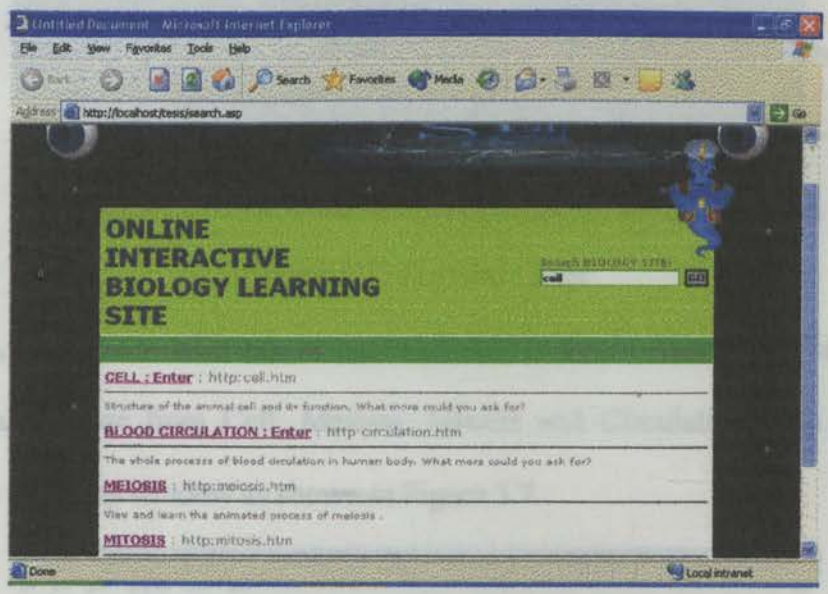

Figure 3.6: Search Page

Users can type in the keyword in the search box and click the search button to view the pages they would want to look for.

3.5 Links

Figure 3.7: The Links page

At this page, the links to other educational sites will be listed. There are 4 categories that the users can choose from Cell, Meiosis, Mitosis and Circulation. The site will be displayed as a pop-up window as shown in Figure 3.7.

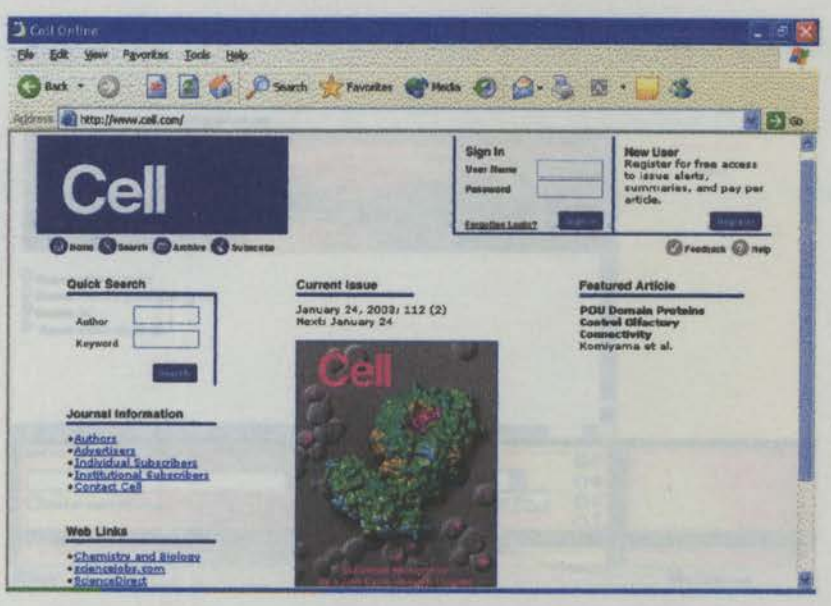

Figure 3.8: A site displayed as pop-up window

3.6 Chat

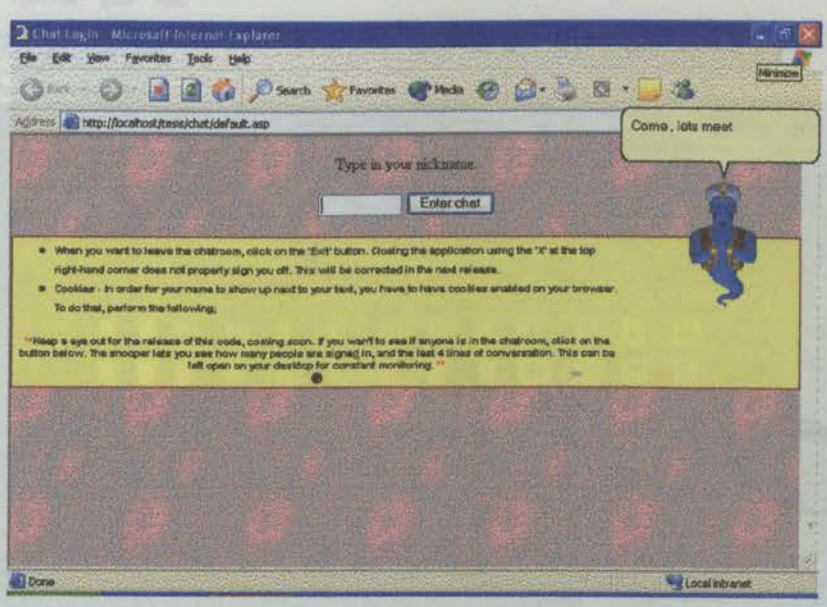

Figure 3.9: Chat- Room

When then users click the 'CHAT' button, they will be connected to the chat-room. To enter the chat-room, they need to submit their nickname and they will be lead to the chat-room where they can meet their friends.

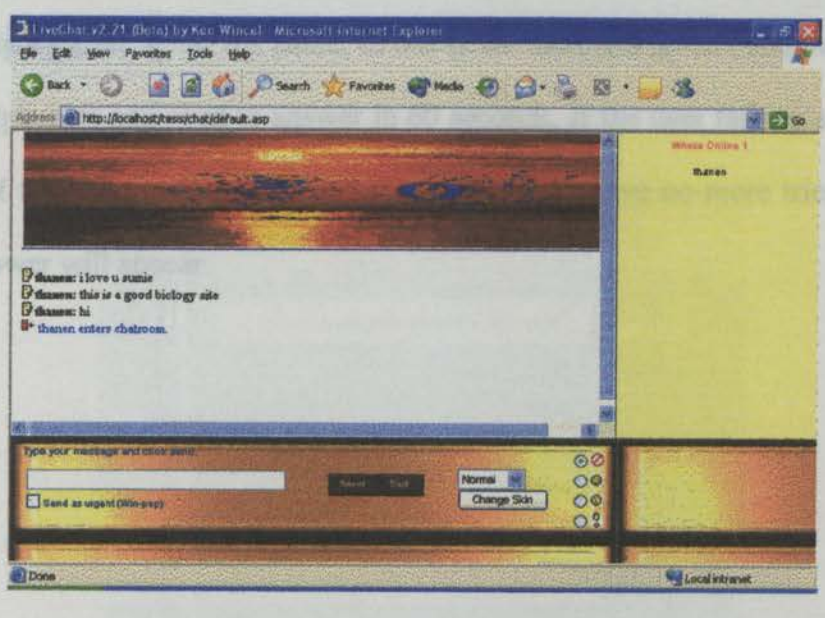

Figure 3.10: Display of Chat- Room

3.7 Game

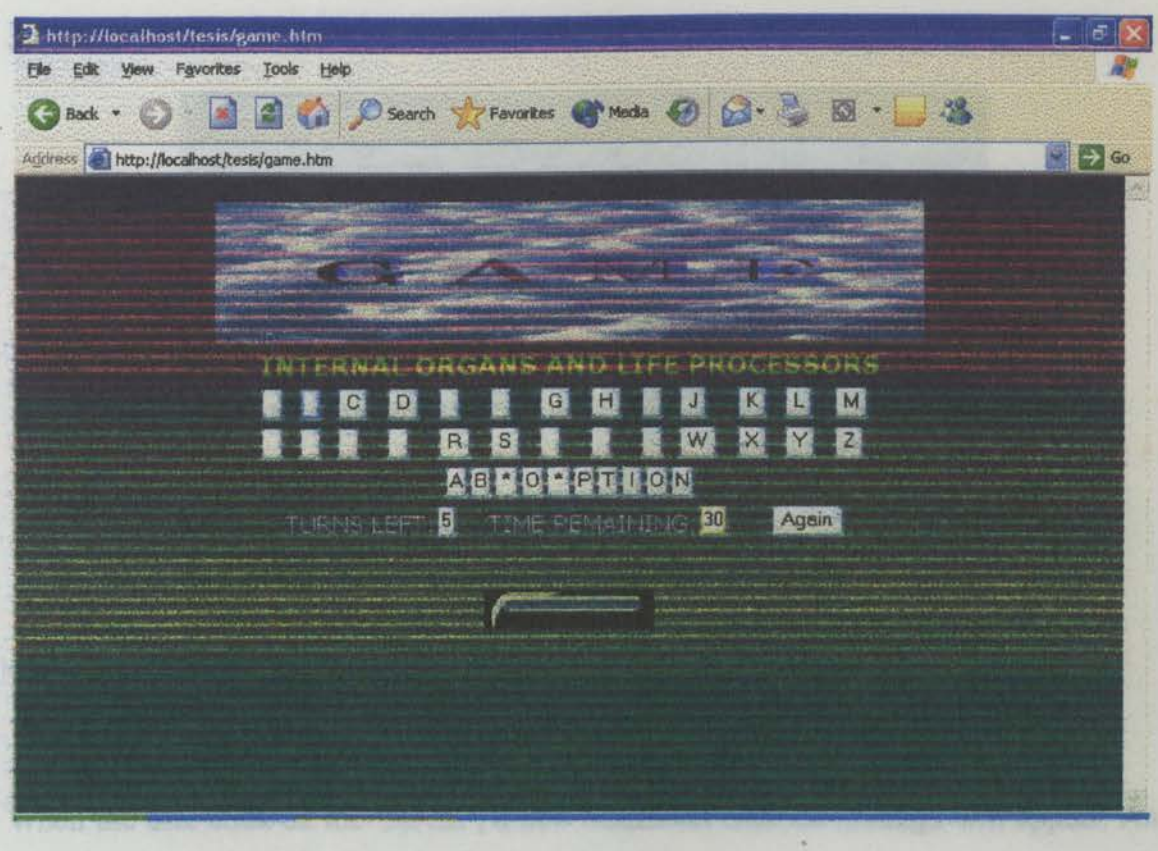

Figure 3.11: Game

Figure 3.11 above shows the 'Guess ' game. Users need to guess the answers for question displayed on top of the game. In this game users are given maximum 10 tries to guess the alphabets and need to answer in 60 seconds. If the user fails to answer within the range of tries or time, an alert message stating you have no more tries or time out with the answer will appear.

3.8 Mail

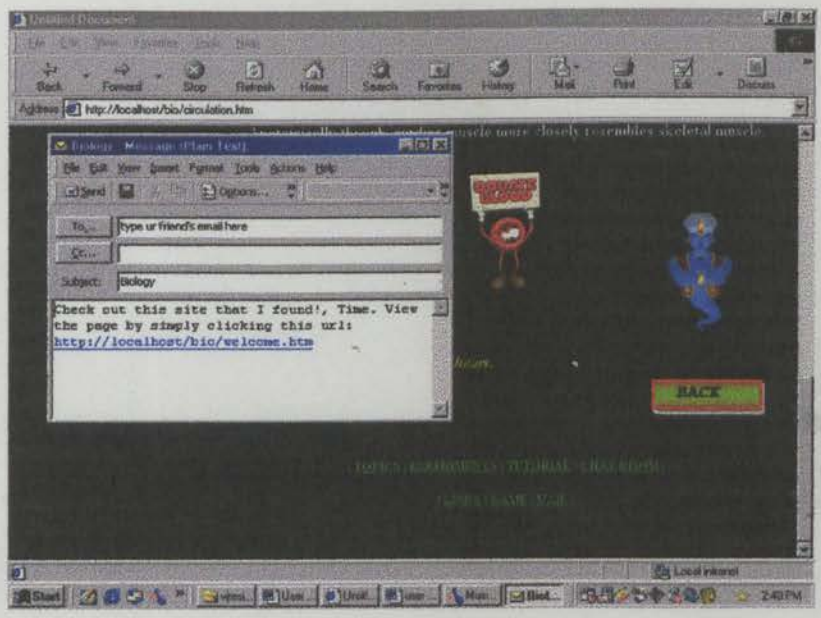

Figure 3.12: Mail

When the user click on the 'MAIL', a new Microsoft Outlook message will appear. An example of the default message is:

- Check out this site that I found!, Time. View the page by simply clicking this url: http://localhost/tesis/index.htm

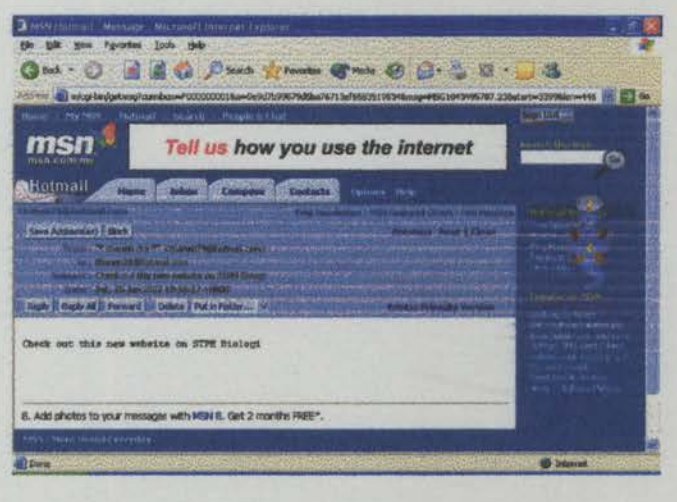

Figure 3.13: An example of the email received